



*8-10-17*

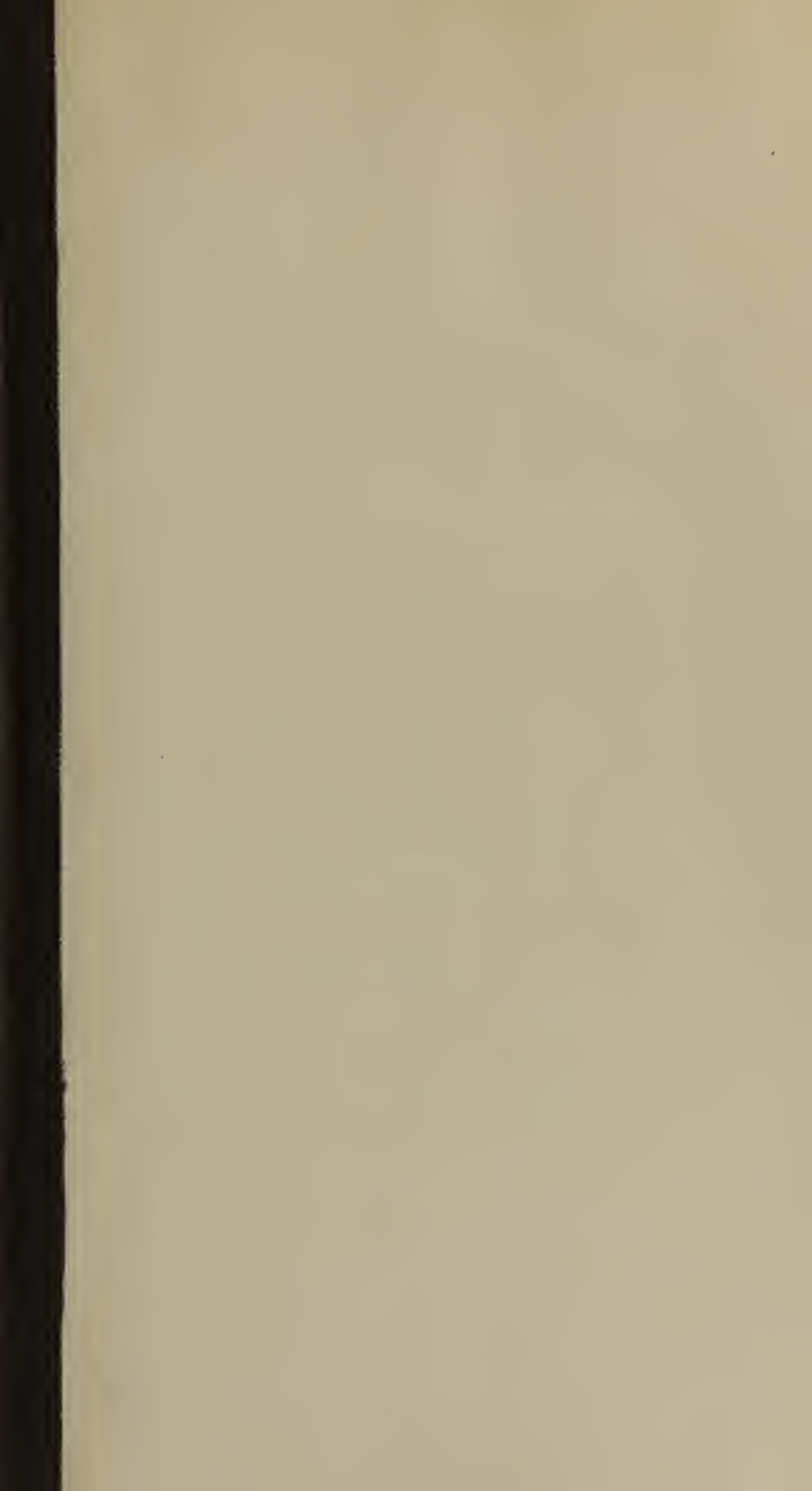
*Library*

ARMY MEDICAL LIBRARY

FOUNDED 1836



WASHINGTON, D.C.







A

SYSTEM

OF

OPERATIVE SURGERY,

FOUNDED ON

*THE BASIS OF ANATOMY.*

VOLUME II.

---

---

BY CHARLES BELL.

---

---

*FIRST AMERICAN EDITION.*

HARTFORD :

PRINTED BY HALE & HOSMER.

.....  
1812.

172793

OTOMAN STATE

0021

## TO THE READER.

---

MANY of the members of our profession are accustomed to draw a distinction betwixt the knowledge obtained in classes or dissecting-rooms, and that practical knowledge which they have gained by experience; and they seem willing to extend this distinction in favour of themselves, by maintaining the superiority of practice over theory.

There may be a defective system of education which gives too much importance to theory, but certainly the ignorance of what has been done by men of the first genius in this way, does not make the surgeon more an observer or a disciple of nature. Ignorance or weakness is as prone to theory as to superstition, and it requires a mind of a higher cast, strengthened by education, to subdue the natural inclination to generalize on a few limited facts.

In conversing with medical men, the most remote from the Universities and practical schools of anatomy and surgery, I have found them indulging in the most fanciful and wild theories. No one ought to be more ready than myself to acknowledge the benefit he has derived from the conversation of practical men; at all times impressed with the importance of their information, I have cultivated their acquaintance with a view to improvement; but even these very men, whose chief value consists in the number of facts which they can attest from their actual observation, have always ready a theoretical interpretation which obscures the

truth. It is not easy for a man altogether to divest himself of this disposition, nor is it to be wished that he should; for then his lively interest in the profession would abate; but it is a propensity that requires to be chastened by education, and by acquaintance with the errors which have been committed in theoretical reasoning.

In what I have now said, the persons to whom I allude are those who, indifferent to what is doing in the profession at large, over-rate their own resources, and are not fully sensible how little any individual can do in improving the general practice of medicine or surgery. Men who assume the merit of having learned all they profess from practice, and who would raise a distinction betwixt principle and observation, are not aware of the extent of their admission. They confess themselves to have entered on the profession but poorly prepared; which is a great offence, since they must long have groped their way in the dark, doing mischief before they have learned to do good. They want the only secure foundation of experience, acquaintance with the structure of the body; and, by entering on a high and responsible duty, with a thoughtless boldness, they render even their very testimony suspicious.

Ever since I became aware of the true means of improvement, it has been my study to seek the conversation of the elder members of the profession. In this search I may confidently say, that I have found their conversation pregnant with information, and their practice safe as well as bold, in the proportion of their acquaintance with anatomy. The best surgeons are, for the most part, the best men in a more extended sense; for humanity of disposition does not merely insure careful study before the duties of the profession are undertaken, but stirs on to active and virtuous exertions through a whole life.

So far, therefore, from desiring to put myself in opposition to men of observation and experience, during the writing of these volumes, I have held myself as in their presence, and I confidently hope that they will receive this book favour-

ably, if I shall be found to have laid the ground-work securely. I propose to form a System of Operative Surgery, founded on Anatomy; and between the title of the book and the execution I hope there is a due connexion: for, if it be only in the title and preface that I have made use of anatomy, I have done nothing more than what has been done by all writers of systems.

As I have built my expectation of being useful on the union of the studies of anatomy and surgery; and as I every day see reason to believe that the neglect of surgical anatomy is still a common defect of education; I have felt myself as called upon at all hazards to prove the necessity of this union. It will not be denied, that there are entering on the practice of the profession crowds of students who are ill provided with a knowledge of surgical anatomy; and there are many in practice who seem never to have acknowledged anatomy to be a science from which the principles and the rules of practice are to be deduced. In short, I cannot help concluding, that though the higher departments of surgery are successfully cultivated by a few, there is not yet a proportionate diffusion of knowledge. Men of the first eminence have sought to obtain that rank by exerting the strength of their talents upon particular subjects; and who is there that can regret this? But still I think I am borne out in saying, that the general subject has been in consequence more remissly cultivated.

It has been my endeavour, throughout this work, to reclaim my reader from a loose method of considering the subject; to carry him back to the study of anatomy; to make him have recourse to the principles, nay, the very elements of the science. I acknowledge that in the dissecting-room the student learns the elements only; that to let loose upon the world a young surgeon, whose education has been confined to dissection, is like arming a man bereft of reason. He is accustomed to use the knife; and desirous of doing it on all occasions; dexterous, perhaps, he may be, but he has not studied the structure farther than it has reference to the dead



body ; while the acknowledged use of anatomy has reference to the living body. He can perform operations, but does not know the fit occasions for them ; nor how much the powers of life will bear ; nor how the constitution varies, and disease affects the natural powers of life.

Having acknowledged thus much, I take this position in favour of anatomy, that there is no doing without it ; no advancing in safety one step, either in study or in practice, without its guidance. The ignorance of it makes a surgeon shy and deceitful ; and what a commentary might be written on these two words ! I am in hopes that, when my reader peruses the chapters in this volume, which treat of Fractured Bones, of Dislocations, and of Wounded Arteries, he will think, that, although it be possible to cull from dissertations on the diseases which fall under the care of the surgeon, and from the lectures of eminent men, what might form a book having more of the external character of a system than these volumes ; it is impossible to enter on the discussion, to go to the depth of the subject for the principle of practice, without a continual reference to the structure ; and that by keeping the anatomy continually in view, the rule of practice comes out more correctly, with more simplicity and force. It is in this sense that I have ventured to call the present work a System ; for I hold a system to be distinguished more by the governing principle than by the apparent order of enumeration.

---

I HAVE to regret, that in the very first part of this volume I have not been able to speak decidedly, as to the rule of practice. I allude to the operation of bronchotomy. I have not performed the operation ; and surgeons with whom I have conversed upon this subject, have not, in my opinion, taken the whole circumstances into consideration. I hope,

however, that I have explained the action of the throat and glottis, and the accidents in practice, so as to prevent the recurrence of some errors which have come to my knowledge. One thing I cannot avoid mentioning : when the patient has struggled for some time with the spasmodic difficulty of breathing, the face is swelled, and of a leaden colour ; an apoplectic insensibility follows ; when you raise him up, the head falls upon the shoulder ; he now breathes with less difficulty in the throat, but if the operation be performed it will be too late ; for the difficulty of breathing through the larynx has ceased in consequence of the general debility having resolved the spasm. This debility of the muscular fibre and insensibility, has resulted from the effusion having taken place in the lungs.

What I have said on the subject of the artificial pupil I wish my reader to consider as a suggestion hitherto ungrounded on the observation of the human eye.

I have considered fractures and dislocations as forming the principle matter of the volume ; and before treating of them, I have thrown the subjects of abscess, and of disease of the spine and of the great joints, into short dissertations, as forming the best introductions to the surgery of the bones ; a subject so important to the practical and military surgeon. By the liberality of my friends, and increasing opportunities of observation, even since these sheets have been printed, I have had cases and dissections which would more fully have illustrated some part of this subject ; but I am happy to say, that no circumstances have occurred, which in any degree, leave me to regret what I have said under this head.

I hope the manner in which I have set forth the anatomy of the arteries will be acknowledged to be useful. For I have found students satisfied with repeating Murray's tables of the arteries, and by that test estimating their knowledge of this important and difficult subject.

I have laboured to discountenance this idea, and to convince them that there is a minute knowledge of the arteries to which they have little turned their thoughts. It is not yet

four-and-twenty hours since I have seen a remarkable example of the effects of inattention to the exact seat of arteries, as they bear reference to the superficial parts, to the nerves and tendons.

To the military surgeon, the book would have been quite incomplete without this last addition of Lessons on the Arteries.

LONDON,

10 & 11, Leicester Street,

Leicester Square.



# CONTENTS

OF

## VOLUME II.

### CHAPTER I.

#### OF OPERATIONS ON THE THROAT.

SUFFOCATION from Bodies sticking in the Œsophagus, or entering the Trachea	-	-	-	-	Page 1
Of the Probang	-	-	-	-	2
Of extracting Bodies from the Œsophagus	-	-	-	-	4
Of Ulceration of the Glottis	-	-	-	-	5
Of Bronchotomy	-	-	-	-	6
Of Bodies lodging in the Larynx	-	-	-	-	10
Of Stricture in the Œsophagus	-	-	-	-	12
Use of the Flexible Tube	-	-	-	-	13
Of Wounds in the Throat	-	-	-	-	16

#### OPERATIONS IN THE MOUTH.

Of Ranula	-	-	-	-	-	17
Of the Salivary Fistula	-	-	-	-	-	19
Of the division the Frænum Linguae	-	-	-	-	-	20
Ulcer and Tumour on the Tongue	-	-	-	-	-	21
Operation on the Amygdalæ	-	-	-	-	-	22
Of the Uvula	-	-	-	-	-	23
CANCER OF THE LIP	-	-	-	-	-	ib.
OF THE HARE LIP	-	-	-	-	-	27
Abscess in the Frontal, or Maxillary Sinus	-	-	-	-	-	28
Perforating the Maxillary Sinus from the Alveoli	-	-	-	-	-	30
WRY NECK	-	-	-	-	-	31

#### OF OPERATIONS ON THE EYE.

OF THE CATARACT	-	-	-	-	-	33
Of Couching, or Depressing the Cataract	-	-	-	-	-	35

	Page
Of the Extraction of the Cataract	41
Of Inflammation of the Eye, and Treatment after Operation	52
Relaxation of the Eyelid	55
Eversion of the Eyelid, (Ectropion)	56
Of the Inverted Eyelid	ib.
Of Tumours of the Eyelids	58
Encanthis	60
Of the Pterygion	61
Opacity of the Cornea	62
Application of Caustic to the Cornea	63
Of the Staphyloma	64
Operation	65
Protrusion of the Iris	66
Dropsy of the Eye	67
Of the Artificial Pupil	68
Extirpation of the Eye	70
OPERATIONS FOR THE FISTULA LACHRYMALIS	72

## CHAPTER II.

DISEASES OF THE EAR	78
---------------------	----

## CHAPTER III.

OF THE PSOAS ABSCESS	82
----------------------	----

## CHAPTER IV.

### DISEASES OF THE SPINE.

Of the Curved Spine	88
Comparison betwixt the Skull and Spine	92
Of Fracture of the Spine	93
Of the Dislocation of the Vertebrae	96

## CHAPTER V.

DISEASES OF THE HIP JOINT	99
---------------------------	----

## CHAPTER VI.

DISEASES OF THE KNEE JOINT	102
Of Collections in the Bursa	107
Loose Cartilages in the Knee Joint	108

## CHAPTER VII.

### OF FRACTURES.

Distinctions relative to Fractured Bones	110
--	-----

# CONTENTS.

xi

	Page
How to Examine a Fracture	112
To distinguish Fracture from Dislocation	ib.
General Treatment of Fracture	114
Fracture of the Clavicle	124
Fracture of the Acromion Process of the Scapula	125
Fracture of the Body of the Scapula	127
Fracture of the Humerus	128
Fracture of the Olecranon	129
Fracture of the Radius	130
Fracture of the Bones of the Hand and Fingers	132
Fracture of the Thigh Bone	ib.
Fracture of the Shaft or Cylindrical Part of the Bone	133
Fracture of the External Condyle of the Thigh Bone	137
Fracture of the Neck of the Thigh Bone	138
Of the Fractured Patella	142
Fracture of the Fibula	146
Of the Fracture of the Tibia	147
Of the Period of Confinement	149
Of Fractures of the Ribs, Sternum, and Pelvis	150
Of a Fractured Rib	ib.
Fracture of the Sternum	154
Fracture of the Bones of the Face	155
Fracture of the Bones of the Nose	158

## CHAPTER VIII.

### OF DISLOCATION.

Of Dislocation	159
Dislocation of the Clavicle	165
DISLOCATION OF THE HEAD OF THE HUMERUS	167
Of the Reduction in Simple Cases	170
Accidental Reduction of the Humerus	172
Reduction Impeded by the Muscles	173
Position of the Humerus necessary to Dislocation	174
Position of the Humerus when Dislocated	175
DISLOCATION OF THE ELBOW	180
Subluxation of the Elbow Joint	181
Dislocation of the Head of the Radius at the Elbow Joint	182
Dislocation of the Wrist	ib.
Dislocation of the Bones of the Hand	183
Dislocation of the Thumb and Fingers	ib.
DISLOCATION OF THE LOWER JAW	186
Dislocation of the Os Hyoides	187
Dislocation of the Rib from its Cartilage	188
Dislocation of the Bones of the Pelvis	ib.

	Page
Dislocation of the Os Coccygis	190
Dislocation of the Hip Joint	ib.
DISLOCATION OF THE THIGH BONE	191
Sprain and Dislocation of the Knee Joint	198
DISLOCATION OF THE ANCLE JOINT	201

## CHAPTER IX.

## OF TUMOURS.

Of Tumours	204
Opinions regarding the Nature and Formation of Tumours	208
Classification of Tumours	215
Treatment of Tumours	223
OPERATIONS TO BE PERFORMED ON THEM	226

## CHAPTER X.

## OF WOUNDED ARTERIES.

Of Wounded Arteries	238
Classification of Arteries in the Order of their Importance when wounded	239
Of the Difference of an Artery opened by Gun-Shot, by Splinters, and by a Knife, with Cases	243
Of the Seat of the Vital Parts in the Thorax	257
DESCRIPTION OF THE MANNER OF CUTTING TO TAKE UP THE ARTERIES	259
To Cut for the Carotid Artery	ib.
To Cut for the External Carotid Artery	260
Of the Thyroid Arteries	ib.
To Find the Lingual Artery	261
Of the Exact Place of the Occipital Artery	ib.
To Find the Subclavian Artery	ib.
The Lower Part of the Axillary Artery, or Beginning of the Hume- ral Artery	262
The Humeral Artery lower in the Arm	263
The Radial Artery	ib.
The Ulnar Artery	264
To Take up the Femoral Artery low in the Thigh	ib.
To Find the Gluteal Artery	ib.
The Ischiatic Artery	265
To Cut for the Anterior Tibial Artery, high in the Fore part of the Leg	ib.
To Cut for the Anterior Tibial Artery, lower in the Leg	266
To Cut for the Fibular Artery	ib.
To Cut for the Posterior Tibial Artery	ib.
APPENDIX, containing some Remarks on Gun-Shot-Fractures	268





FIG. 1.



FIG. 2.



EXPLANATION  
OF  
THE PLATES.

---

PLATE I.

**FIGURE 1.** This figure represents the lower head of the femur, with the capsule of the knee joint; the bone is suspended by the capsule; the articulating cartilage is destroyed, and the face of the bone ulcerated, in consequence of white swelling of the knee joint; the capsular ligament is in part destroyed by ulceration.

A, The face of the bone, rough and carious.

B B B, Small portions of the articulating cartilage remaining, the rest being destroyed by ulceration.

C, Part of the capsule suspended.

D, Ulcerated holes in the capsule, by which sinuses running round the bones in the outside communicated with the cavity of the knee joint.

**FIG. 2.** This represents the thigh bone, with the head fixed and ankylosed in the acetabulum ischii. It is one of those cases of diseased hipjoint, where the inflammation subsided in consequence of the granulation and exostosis of the bone interrupting the motions of the joint.

A, Dorsum of the ilium.

B, Tuberosity of the ischium.

C, Femur.

D, The neck of the femur.

E, The margin of the acetabulum. It may be observed, that the margin of the acetabulum is contracted and eked out, so as to enclose the head of the femur; and even in the macerated state of the bones, though they are loose, they will not separate.

F, The lesser trochanter, which has approached the pelvis so closely, whilst a granulation, has formed upon the pelvis, that the two surfaces meeting have formed a connexion, by means of a ligament which checks the motion of the thigh.

## PLATE II.

FIG. 1. This represents the os innominatum and thigh bone destroyed by the hip disease. There had taken place an absorption of the bottom of the acetabulum, as well as of the head of the thigh bone; so that here the neck of the thigh bone is represented as projecting into the pelvis. Here no ankylosis took place, and the motion of the thigh bone in this unnatural position continued the inflammation so as at last to exhaust the patient by hectic.

A, The os innominatum.

B, The os pubis.

C, The thigh bone.

D, The head, or rather only the neck, of the thigh bone, projecting into the cavity of the pelvis.

FIG. 2. In this figure is represented the caries of the vertebræ, which precedes their yielding to the pressure of the upper part of the trunk, and the confirmed disease described under the term curvature of the spine.

## PLATE III.

In this plate is represented the section of a part of the thigh bone, in the progress of union after fracture.

A, The upper portion of the thigh bone.

B, The lower portion of the thigh bone.

C, An intermediate portion of the bone, which is in a manner isolated.

DD, A tough substance, by which the bones are united, before the new bone is deposited. We may call this the *callus*, being a tough bed, into which the bony matter is afterwards secreted.

EE, The periosteum much thickened.

FF, The bony particles begun to be deposited in the callus.

## PLATE IV.

FIG. 1. The fractured patella, with its ligament.

A, The newly-formed ligament intermediate betwixt the portion of the fractured bone.

B, The upper portion of the patella, which was broken off, and reelected with the quadriceps muscle of the thigh.

C, The lower portion of the patella.

D, The ligament by which the patella is connected with the tibia.

FIG. 2. Another specimen of the fractured patella.

A, The natural ligament of the patella.

B, The lower portion of the fractured bone.

C, The intermediate tendon formed betwixt the fractured portions of the patella.



FIG. 1.



FIG. 2.











FIG. 1



FIG. 2.



FIG. 3.



FIG. 4.



**D, The upper portion of the patella.**

In the case from which the first figure was taken, the portions of the patella still lay on the surface of the thigh bone, and playing over the head of that bone in its motion, threw the action of the tendon off from the centre of the joint, increasing consequently the force of the muscle. The nearer the fractured portions of the bone are to each other, the stronger is the union betwixt them. In the second fig. the intermediate portion of new ligament is longer and proportionably weaker, and, in the next plate, the effect of this will be seen.

**PLAN. FIG. 3.**

A, The lower head of the thigh bone.

B, The head of the tibia.

C, The patella fractured.

D, The ligament of the patella, which connects the lower fractured portion of the bone with the tibia.

E, The muscle inserted into the upper portion of the patella.

This plan shews that when the patella is mounted on the convex surface of the articulating head of the thigh bone, the sudden and violent action of the muscles on the thigh may snap it across, without the knee touching the ground.

**PLAN. FIG. 4.**

This plan is designed to shew the similarity in effect of the fracture of the olecranon at the elbow joint with that of the fracture of the patella.

A, The humerus.

B, The ulna.

C, The olecranon broken off.

D, The cavity into which the point of the olecranon should enter, when the arm is distended in the natural state of the parts.

If the arm be kept bent during the cure, then the space marked by the dotted line betwixt the olecranon and the ulna will be occupied by callus or new bone, and it will then be impossible to extend the arm, for before the fore arm is extended, the olecranon, C, will strike on the back of the humerus, A. We may easily understand, too, that if the arm be too much extended, the ulna, B, will press the olecranon, C, out of the cavity, D; consequently, after the union, the natural check to the extension of the arm will be lost, and there will be danger of a strain of the elbow joint, from the insufficiency of the anterior ligaments to restrain the motion backward.

**PLATE V.**

This plate represents the fore part of the knee joint torn open. It is intended to exemplify the consequences of allowing the upper portion of the patella to be drawn up by the action of the quadriceps femoris muscle.



This man had a fractured patella. The new ligament which was formed betwixt the portion of the bone incorporated with the integuments on the fore part of the joint, so far as to destroy their elasticity in a considerable degree. The man carrying a burden, slipt, and fell backward, and the knee bending under him, the ligament, and with it the integuments of the knee joint burst up, and disclosed the cavity of the joint.

A A, The torn integuments.

B, The articulating surface of the femur exposed. The attempt to unite the integuments failed and amputation was necessary.

#### PLATE VI.

This represents a section of the diseased nerve, spoken of in the text under the head of Tumours.

A A, The tibial nerve.

B B, The fibular nerve.

C C, The tibial nerve enlarged into a great tumour, which occupied the ham.

D D, The surface exposed by cutting the tumour in two parts.

E, The red granulating matter which occupied cells in the tumour.

#### PLATE VII.

This is a slight etching of the knee joint and popliteal artery. This case is given as an example of the effect of a torn popliteal artery, as distinguished from the common aneurism in this artery.

A, The popliteal artery.

B, The hole torn in the artery.

C, The irregular projection of the shaft of the femur which tore the artery.

D D, The coagulated blood condensed and united to the cellular membrane, so as to make an irregular sac.

E, The capsule and integuments of the joint greatly dilated, in consequence of the aneurismal blood having been driven into the joint.

F, the patella raised from the femur, in consequence of the dilatation of the cavity of the joint.

G, A pencil introduced betwixt the heads of the bones, to shew the communication betwixt the irregular aneurism and the joint.

N. B. The irregular bone which projects at C, is a consequence of a previous fracture of the femur; or rather a kind of diastasis; for, when a lad, the leg was forcibly twisted, and the apophysis of the femur broken off from the shaft of the bone. The patient was of mature years before this aneurism took place, from an exertion of the muscles forcing the artery against the projecting bone.











*Plate VII.*





## CHAPTER I.

### OF OPERATIONS ON THE THROAT.

---

#### SUFFOCATION FROM BODIES STICKING IN THE ŒSOPHAGUS OR ENTERING THE TRACHEA.

IT is on no occasion a mechanical obstruction to the trachea which we have to dread from bodies sticking either in the trachea or œsophagus. It is the spasmodic constriction by the muscles of the glottis. There is a provision in the muscles of the glottis, and in the laying down of the epiglottis, against any particle of the food in swallowing passing into the trachea. The same correspondence and sympathy which protects the trachea, is the cause of suffocation when either any small body has passed the glottis, or when a bone or a piece of meat sticks in and distends the pharynx. In neither of these cases is the tube of the trachea filled up or compressed, but while life remains, the presence of these bodies occasions a spasmodic contraction of the glottis and great difficulty of breathing, or actual suffocation.

Even when a piece of tough meat, or cartilage, or a large bone, distends the œsophagus, it does not compress the wind-pipe, but affects the muscles of the glottis only. The most common accidents are these:—A piece of meat or cartilage in swallowing, sticks betwixt the cornua of the os hyoides or thyroid cartilage: coins swallowed by children and stick in the pharynx: fish-bones which stick and irritate very much: a crumb of bread, which being popt into the mouth at play,

enters the trachea: or a husk of grain drawn in by the breath and adhering near the top of the wind-pipe. Even in difficulty of breathing, and of deglutition, proceeding from tumours pressing on the trachea, as well as from these causes, the obstruction of breathing is not continual, but comes in paroxysms, at intervals, and still depends on the same occasional spasmodic affection of the muscles of the glottis. Every kind of obstruction will of course be aggravated upon violent exertion. This in some instances we ought to provide against, as in labour. If a woman have a tumour pressing on the wind-pipe with occasional paroxysms of difficult breathing, we should be prepared to give relief during the exertion and determination of the blood to the head, in consequence of labour: or by free scarifications, prevent the tumour from being gorged with blood during labour.

If we are called to a patient having a bone in the throat, we ought not in an impressive and rapid manner to seize upon him; for this puts him into terror and anxiety that increases the difficulty of breathing. Without much loss of time, it is possible to set down before him in that composed manner which will give him confidence of relief.—Opening his mouth you press down the tongue with a spatula or spoon, and endeavour to see the bone—(we shall often be able to see it, for it may be grasped just upon the entry of the fauces). When we can observe it, we should seize it firmly with a pair of forceps, and extract it. Should we not be able to see it, we may put in the finger by the side of the mouth, and so deep into the throat as to touch the bone, and unfix its sharp points, when the effort to cough and vomit from the presence of the finger in the throat, will throw it out.

#### OF THE USE OF THE PROBANG.

In the first place, we may recollect, that if a neighbour be choking, we ought not to run in search of a probang, for almost any thing may do, to push the morsel down. The



finger, if dexterously put in by the side of the mouth, will often unfix a body, when lying across the pharynx. The end of a table-spoon, or a wax candle, and on some occasions, the end of a whip, has done good service. Nothing is better for pushing down a morsel than a leek. In a child and sometimes in the adult, the finger will extricate the substance, either by pushing it down, or hooking it out.

The probang is introduced by forcing it against the back part of the pharynx. The yielding of the pharynx, and the elasticity of the instrument, directs it down into the œsophagus. The rule may be taken, that all soft or digestible substances are to be thrust down into the stomach, whilst we must endeavour to catch, or pull, sharp and indigestible ones up. But when a large piece of meat, or cartilage, or a crust of bread, or piece of tripe, sticks firmly in the pharynx, we should rather endeavour to bring it up, though it be a digestible substance; for it sometimes is so wedged in, that it will not pass down, and our efforts only fix it the more firmly. If it be within the reach of the finger so that it may be unfixed, the effort of the throat will probably throw it out. Or if this be impossible, the polypus forceps is the best instrument to take hold of it, and pull it forth\*. In short, this must be accomplished in some way, or at least we must have it unfixed from the grasp of the horns of the thyroid cartilage, else the struggle of the patient will soon be over.

People suffocating, may be able to speak at first; but this is soon over, and the surgeon will generally know nothing further, than that the patient is struggling in imminent danger of instantaneous suffocation, and of course the first thing to be attempted, both because bodies in the œsophagus are the most frequent occasion of suffocation, and because it is in that case chiefly where we can instantly relieve the patient, is, to examine the pharynx.

\* Forceps of various sizes should be an indispensable part of surgical apparatus—A pair of curved forceps on these occasions will perhaps prove a more useful instrument than the probang.

A bone we should be unwilling to thrust down, because being sharp, and sticking : to force it down with violence, is to lacerate the œsophagus ; we rather endeavour to pass the hook end of the probang beyond it, and endeavour to pull it up. All indigestible bodies, pins, pieces of money, stones of fruit and shells, we should endeavour to pull up with the hook end of the probang.—And it may be remembered, that such bodies sticking about the top of the larynx, have been forced into it, by the use of the sponge end of the probang. As we have mentioned a substitute for the probang, in order to push a piece of meat or cartilage down, it is equally necessary, to suggest a contrivance for a hook, with which to pull up bodies from the œsophagus, or pharynx. For this purpose nothing is so good, as a piece of wire bent in this manner.—



The advantage of this is that it can be made of any form or take any curve, enabling us to adapt it so, as to operate upon that side where the pin or stone is supposed to lodge. (In nine of ten cases they stick across the throat within sight.) In the way of a regular instrument nothing is superior to a pair of long slender steel forceps with a slight curve, for extracting pins, or feathers, from the gullet.

We are particularly anxious to bring up pins from the throat, because if they pass down into the intestinal canal they may stick there and occasion fatal inflammation, though more frequently foreign bodies swallowed and sticking in the intestines, open a way outwardly by abscess and ulceration. Let us not however take the most unfavourable supposition in the event of a pin being swallowed, for it generally happens that it is passed by stool.

We should not forget that often the soreness left by the body which has stuck in the throat, gives to the patient the sensation of its being still in the place after it has gone down.

Very often small bodies, as crumbs of bread, peas, and cherry-stones, or nut shells, fall at once into the chink of the glottis. Then the breathing becomes sonorous or stridulous with heaving of the chest, and long and difficult respiration—there is not that action, partaking both of coughing and vomiting which is the effect of something sticking in the upper part of the pharynx.

Yet even in this case the patient will not die immediately. Dr. Jeffery of Glasgow has a preparation in which a piece of coal fills the trachea almost entirely, yet the patient lived for three days.

When the foreign body passes entirely into the trachea and does not stick in the more irritable glottis, I believe it gives less distress, though there is every moment danger that the breath may throw it again into the grasp of the glottis and suffocate the person; but of this presently.

The inflammatory affections of the trachea which I have known to prove fatal are, ulceration of the glottis; pustule on the rima glottidis; many instances of croup with the formation of the membrane in the trachea. In all these instances the high excitement occasioned spasmodic contraction of the glottis; that again excited paroxysm, or continued difficulty of breathing; and the difficult breathing, watery exudation into the cellular texture of the lungs. Which last has always appeared to me, on dissection, to be the immediate cause of death.

In two cases of ulceration of the epiglottis where I lately examined the parts I regretted that mercury had not been thought of: for from the history of the case I imagined that there was a considerable probability that the ulceration was venereal. It is I fancy the slight degree of irritability so peculiar to venereal sores, which allows of a continued ulceration of this delicate valve without producing immediate suffocation. I have found too that with nearly similar symptoms an ulcer had made considerable progress in the sacculus laryngeus, and even lower in the larynx.

The fact that those who die by suffocation from irritation or obstruction of the trachea are at length carried off by an infiltration into the cellular substance of the lungs, suggests with it an important consideration in surgical practice, viz. that in this as in many other operations, those performed for the relief of the immediate paroxysm are unsuccessful, because they have been too long delayed and another disease has supervened to the first.

The occasions which may, according to general opinion, call for the operation of BRONCHOTOMY are, swelling of the tongue; or swelling of the glands from salivation; tumours of the amygdalæ\*; ulceration of the upper part of the trachea or epiglottis; sudden and violent inflammation of the top of the larynx; bodies wedged in the pharynx, or upper part of the œsophagus from which there is instant danger of suffocation, while our efforts to extract the bodies are ineffectual. In these emergencies if the operation is to be done ten to one that no regular apparatus is prepared, but if it should be deliberately set about, then we may thus perform it.

#### OPERATION OF BRONCHOTOMY.

THERE are two places at which the operation may be done. 1. Above the cricoid cartilage. 2. Nearer to the sternum and on the face of the trachea. The latter of these places I should prefer where there is inflammation. In the first place because it is more removed from the moveable glottis, the spasmodic constriction of which is probably the cause of the suffocation; and also because I conceive the operation may be performed in the trachea by merely making an incision and holding the edges of the trachea asunder with a small spatula, or any such instrument.

To perform the operation betwixt the thyroid and cricoid cartilages, the surgeon, placing his finger upon the promi-

\* These I suspect may cause much alarm, but not actual suffocation.



nence of the thyroid cartilage, or *pomum Adami*, carries his finger down upon the fore part of the throat for the space of a full inch ; he finds there a depression and softness ; moving his finger further down he feels the cricoid cartilage like a ring encircling the throat, but it is above this ring and in the spot where he feels the depression into which he is to introduce his canula. A large silver catheter, or the canula of a trocar, or even a large goose quill, or best of all, a piece of sheet lead rolled into a tube and smoothed, will be a substitute for regular apparatus. These I mention now, because it is an operation which requires to be done on the spur of the occasion. The regular instrument with the double canula is to be found in the shops ; but I imagine a simple canula, having a slight but equal curve, and with a blunt stilette would serve every purpose. For the perforation being made into the trachea by the common lancet, the conical point of this instrument would easily follow.

The size of the canula should be that of one of the nostrils.

The surgeon makes an incision over this place with a small scalpel if he has it, or with his common lancet. He then clears the blood away and if possible waits until the bleeding is stopt, (using what means he can to that effect), then with the point of his lancet he perforates and introduces his canula obliquely downward and backward.

In performing the operation on the fore part of the trachea these precautions ought to be observed.

As in the other case we ought to have a scalpel, a lancet, canula, and stilette. When the finger is carried from the cricoid cartilage downward, a softer eminence is felt on the fore part of the trachea, immediately after the finger has passed the cricoid cartilage :—This is the isthmus of the thyroid gland, and is carefully to be avoided. Below this, then, the external incision ought to be made, and carried downward an inch and a half. In the next touch of the knife the thyroid veins are to be avoided, and the *sterno-hyoidei* and *thyroidei* muscles put aside. If the veins have been put carefully aside, not cut across, and the thyroid gland has been avoided, there

will be no bleeding to interrupt the further operation of cutting into the trachea, and introducing the canula. The cut into the trachea is made betwixt two of the rings, with the same knife which is used for the first part of the operation, or with a lancet. It is recommended by some to push in a sharp stilette and canula, without a previous incision of the trachea. The intention of pushing a trocar and canula into the trachea without making a cut, is, that the canula may so exactly fill the opening in the trachea that no drop of blood may fall into it.

Authors speak on this subject, as if a drop of blood entering the wind-pipe at this place, would irritate and excite the lungs, as an excoriating humour, or a hard substance does the glottis or epiglottis. Bleeding is if possible to be avoided, and I believe it always will be possible; but this dread of bleeding is not to make us defer this operation under the idea, that it requires a very particular apparatus. As we have the tube in the hand, cannot the incision be adapted to it, and if there is an oozing of blood, can we not tie a dos-sil of lint round the canula, and which pressing upon the trachea around the opening, may either suppress the bleeding, or at least hinder the blood from falling into the wind-pipe, should the opening be twice the size required to pass the tube? Hurry and confusion however in this operation, and inattention to this subject, will lead to the most terrible consequences. A friend of mine and a very celebrated surgeon, told me he saw a gentleman die of loss of blood, and the falling of the blood into the trachea; I suppose the operator must have cut upon the substance of the thyroid gland.

In a child the trachea is very small, and operating with canula and stilette it has happened that the trachea was transfixed!

The tube being introduced, the surgeon will naturally hold it with his fingers until the respiration is fully restored, it may be then fixed and the process is this: folding a large piece of lint together, it is cut into a circular form, then it is slit up to the middle and a part cut out to answer to the



canula. This compress (now consisting of distinct pieces) is to be put betwixt the wound and guard of the canula, so as to keep the end of the canula its due length, inserted into the wind-pipe. Now a band put round the neck may be fixed to the tube and compress it sufficiently, without forcing it too far into the wind-pipe.

When the skin and perhaps the thyroid gland swell in consequence of the operation, then may several of the pieces of cloth be taken from betwixt the wound and the guard of the canula; so as to allow the extremity of the canula still to keep its place in the wind-pipe.

Having secured the present safety of the patient, our attention will be naturally called in the next place, to remove the cause of the obstructed respiration, whether it be a foreign body sticking in the glottis, or something in the pharynx, or an inflammatory swelling.

I have been several times on the eve of performing the operation of bronchotomy, but I have never done it. And this is the case with many surgeons. I cannot therefore speak with the same certainty on this subject that other authors have done. But to bring the subject into as short and practical a view as possible, I have thus concerted it on these occasions: viz. first to introduce a flexible tube into the trachea through the glottis, and if this should not be attended with the desired effect of establishing a free respiration, then to perform the operation of bronchotomy.

I introduce the tube through the glottis, because in every case I have yet seen, the occasion of the difficulty of breathing was to be found in the spasmodic closing of the glottis, and if the tube is introduced into the rima glottidis so as to secure the passage of the air, the play of the lungs will be free. The only question which remains is, whether the presence of the tube in the larynx will not (in the intimate connexion which exists betwixt this part and the respiratory muscles) produce such irritation, as still to cause a spasmodic coughing. But I believe that it will not be found to have this effect.

The substitution of this simple introduction of a tube to the formidable operation of bronchotomy, would have this happy consequence, that it would be resorted to with less unwillingness, and frequently early enough, to save the patient.

When the operation is to be done for a body which has fallen into the larynx or trachea, there may be some circumstances peculiar in the treatment.

#### OF BODIES LODGING IN THE LARYNX.

WHEN a body is drawn into and lodges in the larynx, it may be known from the convulsive cough, wheezing and rattling in the throat, the weakness and hoarseness of the voice. Sometimes when there is a dreadful difficulty of breathing, the symptoms will suddenly remit, and the person become easy. After several changes from tranquility, to laborious respiration, and from difficult to easy breathing, the patient may be at the end of some days, suffocated suddenly. It happens thus I believe, the body is loose, and is sometimes lodged in the trachea, sometimes near the glottis. When in the trachea, (the sensibility of which is much less than that of the upper part of the larynx), the patient breathes easily, but when the body is moved towards the more sensible glottis, then comes the spasm of the muscles of the glottis, and great difficulty of breathing. Mean time with each successive attack, the parts are inflaming and becoming more irritable, and the violence and difficulty of breathing, is producing a degree of effusion in the lungs which increases the evil. One more severe paroxysm succeeds and the patient is suffocated. It would be easy to furnish many striking cases of children thus suffocated.

1. We have to ascertain the nature of the accident. See that the cause of suffocation, be not in the upper part of the pharynx, and ascertain the nature, and size of the foreign body. 2. Observe, whether posture by throwing down the body into the wind-pipe, does not relieve, and if the sense of suffocation, has been preceded by posture or circumstances,

which would favour the shifting of the body, into the rima glottidis. 3. We have to observe, if the breathing become more difficult even in the interval of the spasmodic attack. 4. If from the greater violence of the paroxysm, the membrane of the larynx be inflaming and swelling, then the danger is imminent, and the operation seems to be the only remedy. 5. If there be any puffness, or emphysematous tumour of the neck, during the previous stage of suffering, before the operation is determined on, there may have occurred a bursting of the trachea.

We bleed frequently, and give an opiate in a mucilaginous mixture, which is to be taken by frequent sipping, rather than as a draught. For this will often give relief of the teasing, tickling sensation that precedes the paroxysm. It has been recommended that we should excite vomiting, or sneezing, which by the suddenness of the action of the respiratory muscles, may throw out the body from the larynx. But should the body be removed more directly into the current of air, by this means and yet not altogether discharged, the consequence would be sudden suffocation.

There are two operations proposed, the one may be thus conducted.

1. To lay bare that part of the trachea, which is inferior to the isthmus of the thyroid gland. 2. Let the bleeding be entirely stopt. 3. Slit across three of the rings of the trachea, that it may be held open by introducing a small spatula, which will allow the patient to breathe freely, and having established free respiration, will then enable you to introduce a probe, or bougie, upwards through the larynx. So that the foreign body may be pushed forth.

But if the body should be fixed as I have seen it, after death, it will be no easy matter to dislodge it, in short we may not find it, and we may not be able to extract it! which makes the operation precarious and dangerous. Before thinking of such an operation, the surgeon will of course provide the complete apparatus for the operation of bronchotomy, lest he should be obliged to introduce the tube, without extract-

ing the foreign body. And he ought to accomplish himself with what variety of probes, probangs, and forceps, he may think eventually necessary, either to extract the body, or to push it out from the glottis.

The operation recommended by Desault is this. The instruments are a sharp pointed knife, spatula, and forceps.

The patient is to be seated, and the head held to the breast of an assistant, who stands behind. The skin over the thyroid cartilage, is to be a little drawn aside. An incision is now to be made through the skin, laying bare the prominence of the thyroid cartilage and the cricoid cartilage. Then the two lateral parts of the thyroid cartilage are to be slit asunder, and being held so, the foreign body can be extracted with forceps.

#### OF STRICTURES IN THE ŒSOPHAGUS.

WHEN we consider that the Œsophagus is a powerful muscular tube, and that it is liberally bedewed with mucus, and consequently is of a glandular structure, we have a key to the knowledge of its diseases.

It is not wonderful that a muscular tube, connected with the stomach, (which is the source or the seat of so many strange and varying symptoms,) should frequently suffer by the irregular action of its muscular fibres\*. It is however the permanent stricture of the Œsophagus I have to mention here.

The stricture of the Œsophagus is marked by a gradually increasing difficulty of swallowing, there occurs often irregular pain in the stomach, and frequent reaching with the dis-

\* Spasmodic affections of the Œsophagus, may be removed by rubbing camphor and opium, or æther, on the sides of the neck; or by swallowing a very little tincture of opium. Valerian and camphor may be given by the mouth or by injection. The irregularity of the uterine action, the general state of the system, and of the uterine discharges, must be attended to. When the spasm continues obstinate, the dexterous use of a bougie will sometimes relieve it.



charge of mucus collected in the œsophagus. Sometimes there is a considerable general irritation, with fits of suffocation ; the voice is remarkably weak.

For this complaint, as in the stricture of the urethra, the bougie and caustic are used. We sound with the bougie to ascertain if there be a confirmed stricture, and not merely a spasm or paralysis. We are to endeavour to accommodate the form and size of the bougie so as gradually to stretch the contracted part ; and this failing of its effect, or being attended with an increase of the mischief, we have still the use of the caustic in reserve. This practice is strongly recommended by Mr. Home. I cannot at present take the merit of making a single observation on the subject.

#### OF THE USE OF THE FLEXIBLE PIPE, INTRODUCED INTO THE ŒSOPHAGUS.

It is not long since, the only means suggested to us of nourishing a patient who had an obstruction of deglutition, was by clysters, or by forcing down solid food into the œsophagus by the probang.

It was therefore a very happy invention of Mr. Hunter, in a case of impeded action of the throat, to cover the probang with an eel-skin, which, being introduced into the stomach, enabled him to inject nourishing soups. For the same purpose we now use the flexible gum-tube, having adapted to it the nozzle of a syringe, or injecting-bag and pipe.

In the introduction of the tube, we must be careful that we do not commit a blunder, which though not likely to happen, yet because it may happen and prove fatal, we must always consider ; I mean the introduction of the tube into the wind-pipe, instead of the gullet. In the first place then it is wrong to make the patient open the mouth wide and push out the tongue, and at that instant to introduce the tube quickly, for by the projection of the tongue, the epiglottis is raised to the utmost ; and if the patient should have such a command over himself, as to persevere in keeping the tongue thus, while the

tube touches the throat, the point of the tube may pass into the glottis. On the contrary the patient should be directed to do that, which indeed he will naturally do, when he feels the tube in the fauces; let him imitate the action of swallowing, draw back the tongue, and consequently push down the epiglottis: and the tube should not be passed quickly into the throat, but slowly, moving the point of it off the soft palate to the back part of the pharynx, when (being flexible) it will be directed into the bag of the pharynx and into the œsophagus.

Yet after this precaution, and when the tube is in the œsophagus, we pass the upper part of it through a sheet of paper, and then hold the flame of a candle to it. It has happened that in this experiment the air rushing from the tube, has shewn it to be in the trachea, and not in the œsophagus!

The liquid food which is to be thrown into the stomach in this way, must be cooler than what a person could take by the spoon, for it flows continually hot upon one part of the stomach. And I have dissected a body where I suspected a patch of inflammation, in the inner surface of the stomach, proceeded from this cause.

If it should be thought necessary to keep the tube in the œsophagus for any considerable time, it must then be introduced through the nostril; and here it is necessary to be still more particular that the throat, be exerted, as in swallowing, in order that the tube may pass into the pharynx.

There are many occasions on which the tube is to be used to convey nourishment into the stomach: for example, in young women affected with hysteria, paralytic affection of the œsophagus is not unfrequent, and they would die of this trifling complaint but for this invention. I have attended a girl who was nourished for two months in this way, the affection of the throat was entirely cured, but some months after she died of a complication of disease.—The œsophagus on dissection was quite natural. Ulcerations in the tract of the œsophagus I imagine are perpetuated and increased to a fatal degree by the perpetual irritation of the œsophagus in swallowing. The action itself is an excitement, and



the matters swallowed cannot fail to lodge about the ulcerated surface. In this case the use of the tube will form a necessary part of the cure.

The œsophagus is subject to a cancerous ulceration. It becomes hard, and irregular, and ulcerated, and the muscular structure of the tube being destroyed, the continuous action, by which the food is carried into the stomach, also fails, and the flexible tube is necessarily employed.

Sacs are sometimes formed of the pharynx. At first, by some accidental lodging of the stones of fruit, perhaps, and afterwards by the accumulation of the food. Each meal forcing a little more into this hole or sac, it is at last enlarged into a bag, which having formed by the side of the œsophagus, and being crammed with the food in the attempt to swallow, presses upon the œsophagus, and obstructs the passage into the stomach. If the flexible tube be used, the food will no longer accumulate in the lateral sac, and this sac may shrink and be obliterated.

Abscesses, forming by the side of the pharynx, and opening into it, afterwards receive the food in the act of swallowing, with even a worse effect than in the last instance; this too the flexible tube may palliate or cure.

When a person has attempted self-destruction by firing a pistol into his mouth, and the brain and spinal marrow and carotids have escaped, there is danger of suffocation from the inflammation and swelling of the throat, and the action of swallowing is for a long time impeded. Here the tube has been of essential service.

When the attempt at suicide is made by cutting the throat, the action of swallowing impedes the cure, because the larynx is pulled up in swallowing, and by this means the union of the trachea is prevented, and even the outward wound torn open; and here the flexible tube is also of great service.

## OF WOUNDS OF THE THROAT.

THE cutting of the throat, in the attempt at suicide, is so very common an occurrence, and requires the assistance of the surgeon so frequently, that it becomes necessary to speak of it, under a distinct head.

Of all the ways of putting a period to existence, the cutting of the throat is the most dreadful, to the sane imagination. But it is the horror of the deed, on which the insane wretch broods. It is the vulgar idea, that it is the cutting of the wind-pipe, not the opening of the great vessels, by which the man dies. So the suicide very often cuts only on the fore part of the throat, and does not perpetrate the deed. Or not liking the experiment, or perhaps the edge of the knife striking on the firm cartilage, or bone, the wound is small and the deep vessels are not touched.

Sometimes he draws the knife across the throat, higher than the os hyoides, and then the root of the tongue, and the lingual artery are cut ; the muscles uniting the jaw, and os hyoides are cut ; the lingual artery bleeds profusely. Perhaps the ninth pair of nerves, and the salivary ducts are wounded. The saliva and fluids attempted to be swallowed, flow from the wound. The voice is feeble and inarticulate, and there is danger of suffocation, from the fluids and blood falling into the larynx. Sometimes he cuts down lower than the os hyoides, and betwixt it and the thyroid cartilage, and then the epiglottis may be separated from the larynx. Speech, deglutition and respiration are difficult. When he cuts upon the thyroid cartilage, he does little harm, but when he cuts lower down he strikes the thyroid gland, and opens its vessels.

In whatever way the throat be cut, the bleeding is the immediate danger ; the person dies of hæmorrhagy or from the blood, entering the wind-pipe, and suffocating ; and the source of the blood is from the deep angle of the wound, generally the superior thyroid artery, or the lingual artery ; if the carotid is touched, the patient is gone. Before the surgeon is

called, perhaps the vessels have emptied themselves, and the faintness prevents the full jet of blood, and immediate death.

The thumb is to be pressed into the angle, or a piece of sponge is thrust in by the side of the throat, until a ligature is thrown over the tenaculum ; then lifting the finger from the spot from which the blood flows, one vessel will be observed to project with each pulsation, which being taken up, other lesser branches may require to be tied. During this operation, the posture must be such as to prevent the blood falling into the trachea.

When the bleeding has entirely stopt, the integuments are to be brought together by two or more stitches ; then a bandage is put about the head, and the ends of it brought down from the sides of the head to a circular band round the chest, by which the chin is kept down upon the breast, and the trachea and the lips of the wound kept together. A strait jacket is now put upon the person. The food and medicine is to be given by the flexible tube, introduced into the gullet, if a great part of the trachea is cut across ; for the motion of the throat in swallowing, impedes the union of the wound.

What proves the most distressing circumstance during the cure, (especially if the wound has been near the glottis), is the rising of inflammation, and the consequent irritation and cough. It is difficult to allay the thirst without varying the position ; lying on the back for example, the patient will be able to swallow a little, or moisten the parched fauces.

#### RANULA.

RANULA is, in general, a semipellucid tumour lying under the tongue and in its commencement situate to one side of the frænulum linguæ. It is described as having its origin in the obstruction of the salivary glands ; and accordingly it is not confined to the seat of the sublingual gland, but appears sometimes in the cheek, in the place of the parotid duct, and then it is more fleshy and vascular. It is described as begin-

ning without pain, the feeling of distension being alone troublesome. Such indeed has been the account of the patients I have seen with this complaint ; but I know that an obstruction of the salivary ducts is an extremely painful complaint, and so peculiar in the pain and distension of the salivary glands, under the tongue, upon tasting sapid food, or on the action of the muscles of the jaw, that the patient would not be apt to overlook the beginning of the disease.

If we say that Ranula is a semipellucid tumour, like a frog's belly, under the tongue, then there are two kinds, the one arising from the distension of the salivary duct ; the other, a simple incysted tumour. I believe they have been much confounded. If we define it to be a distension of the salivary ducts, then it is not always under the tongue, but is common to the other ducts. This complaint, under the tongue I have seen in an infant, and I believe it is frequent in them, from original obstruction of the duct. In adults, it is sometimes found to be complicated with, and to have taken its origin from salivary calculi in the mouth of the duct.

When it is in its most frequent place, under the tongue, and is allowed to grow, it forces back the tongue, and occasions difficulty of swallowing, and inarticulate speech ; and in children it prevents sucking.

It would appear that this is sometimes a much firmer tumour than those I have seen, insomuch, that, by pressing forward, it has affected the teeth, and so far pressed back the tongue, as to occasion difficulty of breathing. When formed in the cheek, it has forced itself under the zigoma, and has prevented the free motion of the jaw.

The practice is, to lay these tumours freely open. Unless this be done freely, it will return. In its return it will often lose its transparency, and by the necessity for frequent punctures, it becomes a thick and fleshy bag, requiring either extirpation, or escharotic and caustic dressings.

CALCULI form in the salivary ducts ; sometimes they lodge near the mouth of the duct, without producing a tumour, and then with the touch of a lancet over the extremity of the



duct, they may be drawn out with forceps; or the calculus produces much irritation, and a suppurating sac is formed. After the extraction of the calculus, the injection of a slightly astringent fluid, with the syringe for fistula lacrymalis, cures it.

## OF THE SALIVARY FISTULA.

THIS fistula differs essentially from other fistulous sores, connected with the natural ducts, or passages. It is not the consequence of obstruction, but of cuts upon the cheek: for it is on the cheek that they chiefly occur, from the very exposed situation of the duct of the parotid gland.

This sore forms a fistula of a very unpleasant kind; since while sitting at dinner, or when masticating, the flow of saliva, is very profuse, and a failure of appetite, we are told, is the consequence of this discharge. I doubt the truth of this latter circumstance.

If there occur a recent division of the duct, by a wound penetrating the cheek, near its termination, we have only to take care that in using the twisted suture, the skin of the cheek be very accurately united, while the inside of the cut is left free, for the discharge of the saliva, from the duct, into the mouth. When we do this, the duct may chance to unite again, or though it do not, yet if the outward skin be united, the saliva will find its way into the mouth.

The chance however is, that the case presents in the form of callous holes, discharging saliva. In which vain attempts have been made to cure the sore, by compresses, and escharotics. The duct may have been divided, as it passes over the masseter muscle, and of course without the wound penetrating the mouth.

In this case of a fistula of some continuance on the cheek, we have to establish a communication betwixt the duct, and the mouth, and then to heal the outward wound. Our first attempt will be, to pass a small silver probe, from the mouth into the natural opening of the duct, and enlarge it, if

it shall be contracted ; then to substitute a small tube, which being introduced from the mouth, shall also pass some way into that part of the duct, which discharges the saliva. Lastly, while the tube is retained in its place, the outward lips of the wound are to be made raw, brought together, and healed.

But the circumstances of the case may be such, that it will be better to make a new duct, from the fistulous opening into the mouth. To do this, we must push a straight needle, obliquely from the bottom of the fistula, into the mouth, and draw through a small seaton, which is to be worn until the passage is callous. Then either with or without introducing the tube, we have to endeavour to unite the edges of the outward opening.

#### DIVISION OF THE FRÆNUM LINGUÆ.

THERE are few surgeons who have not cut the frænulum linguæ. Notwithstanding this, I venture to say that it is never absolutely necessary. There may be an expediency, when the surgeon has not weight enough with the mother to convince her that her child cannot be prevented from sucking from this cause. Sucking is effected chiefly by the motion of the lower jaw ; and the tacking of the tongue even forward to the gums, will not prevent the motion necessary to sucking. I doubt even whether this tying of the tongue, will impede the speech. But at the age, which has such a motive for the operation, I have less objection to it. In infancy, the consequences have been well ascertained to be suffocation from swallowing the tongue, and death from sucking, and swallowing the blood during sleep.

To do this, or any other little operation under the tongue, an assistant having the child on his knee, puts his fingers into each side of the mouth, and under the tongue so that he pushes it up. With blunt pointed scissors, the surgeon cuts the membranous part of the frænum, taking care to avoid the larger veins, and that in the motion of the child,



he does not cut into the substance of the tongue, so as to touch the ranine arteries.

## ULCER AND TUMOUR ON THE TONGUE.

THERE occurs very frequently on the tongue, an ulcer, with a foul cineritious coloured bottom. We have to examine whether it may not have arisen in consequence of its being incessantly torn, and irritated by a spoiled and ragged tooth; in which case the tooth must be drawn, or filed down and smoothed. But chiefly we must be careful to observe the connection with the stomach, for I believe this to be a frequent cause of this ulcer. This will readily be believed, when we consider the intimate sympathy betwixt the tongue, and stomach, made apparent to us on many occasions; as by the state of the secretion of the tongue, influenced by the healthy and diseased action of the stomach.

When neither medicine, nor diet, have influence on the ulcer of the tongue; when it becomes painful, and the edges rise and are ragged, the ulcer may be cut out, after which the tongue quickly heals.

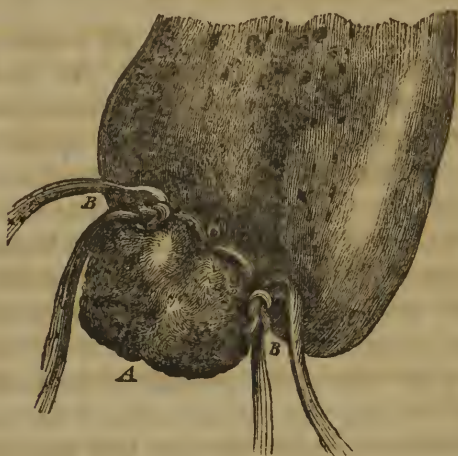
To do this the common tenaculum is introduced into the substance of the tongue, so as to pass under the ulcer. Then with a common scalpel, run along the convexity of the tenaculum, the diseased part together with the instrument is cut out. The tongue may be cut very freely, but let the operator be aware of the situation of the ranine arteries.

When, however, the disease of the tongue is deep, when excrescences with deep roots grow upon it, or when there are small, firm tumours, formed in its substance, we adopt the means suggested to us by Mr. Home\*.

Having well examined the depth, and utmost extent of the disease, a crooked needle (drawn to the middle of the ligature) is passed through the substance of the tongue, beyond the diseased part, the middle of the ligature being cut,

\* See his Observations on Cancers

the needle is taken away, and the ligatures remain. There are now of course two ligatures one of which is to be tied, in each side of the diseased part, so as totally to obstruct the circulation in the insulated portion. As is here represented.



*A, the diseased portion ; B, B, the ligatures tied ; C, the point at which the needle was passed.*

In a few days the diseased part drops off, and the surface left by this separation looks sloughy, but becomes soon clean, and fills up in a wonderful degree. The pain is much less than we should be led to expect. A salivation is sometimes the effect of the operation.

#### OPERATION ON THE AMYGDALÆ.

IN the inflammatory sore throat, these glands swell enormously, so as to produce an apprehension of suffocation. But when they suppurate fully, they burst and the relief is perfect. In imitation of this, we have sometimes to pierce them in order to evacuate the matter. Often this does not succeed, that is to say, the matter is not fully evacuated. But shortly after the matter is spontaneously discharged. Perhaps this is, because the matter is behind the glands, or

in the duplicature of the arches of the palate. Be this as it may, deep scarifications of the glands of the throat do no harm. When the tumefaction is thus great in degree, and although the matter be not evacuated, the discharge of blood relieves the swelling and tension.

All the glandular apparatus of the mouth, and throat, is subject to disease; none more frequently than the amygdalæ, for often after swelling enormously in their inflammatory affections, instead of entirely subsiding, or suppurating, they degenerate into hard tumours, if not scirrhusities. These tumours of the amygdalæ, besides occasioning much inconvenience, from the difficulty of swallowing, produce a remarkable change on the voice, and require to be taken out.

These diseased glands have been violently torn away, an operation not to be imitated. The French surgeons cut them with a concealed knife, but I conceive the ligature is still preferable.

The ligature may be thrown on the tumour, in the manner I have described in speaking of the operation on tumours in the rectum.

#### OF THE UVULA.

THE uvula often hangs down relaxed, producing a feeling which the patient is most anxious to be rid of. Very simple means will often succeed in causing it to be drawn up, viz. to touch it once, or twice, with a little Cayenne pepper and to use astringent gargles.

When this does not succeed, and there is a real enlargement, and prolapsus, the ligature, or scissors may be used to free the patient of it entirely.

#### CANCERS OF THE LIP, &c.

WHEN the lip is the seat of cancer, the disease seems to be less virulent in its nature, than when in any other part of the body. Here excision promises perfect security.

This disease I believe is not often a true cancer but arises from some accidental irritation, and is kept up by the incessant motion of the part. And this too I believe to be the reason why the disease is so frequent in the lower lip, and in the angle of the mouth, for the upper lip has least motion. While other remedies have been applied, I have always strongly recommended the use of an adhesive strap, to retain the lip, as much as possible from motion. And this fixing of the lip, is the advantage gained by poulticing those sores. My attention was drawn to this circumstance, from observing that in very bad cases, some of the slighter ulcerations situated by the side of the greater diseased portion, and which could not be included in the portion cut out, healed while the pins were in the lip. I naturally conceived this to arise from the perfect repose of the lip, after the operation.

I need here only state the fact, that venereal ulcers have been cut out of the lip, being mistaken for cancers, and that the disease has broke out again, and yielded to mercury. This will be a sufficient caution, to make us examine both the history of the disease, and the concomitant symptoms before we operate.

The most frequent beginning of this cancer of the lip, is an irregular warty excrescence with a broad base, or an obscure tubercle within the lip. When a sore, or disease is spreading, from such a commencement, I would not delay extirpation.

The following method I prefer to the common one of using forceps. A flat piece of wood, is shaped to go down betwixt the lip, and the gums, having a rude handle, which the assistant holds, at the same time that he stretches the lip upon the piece of wood, and presses it down upon its edge, so as to prevent the bleeding of the labial artery.

Now the surgeon thrusting his tenaculum or hook, into the diseased part, makes an incision on each side, down to the wood, and meeting so as to make a neat angle below, he cuts out a triangular portion of the lip, including the disease.

The nicety, if there be any in this operation, consists in adapting the two incisions, so that the cut surfaces may come



accurately together, without puckering, or ruggedness at the lower angle.

For example, if the incision of one side should be in a curved direction, and the other more direct, the effect will be, that when the parts are brought together, the side with the curved incision is deeper than the other.

Fig. 1. represents the part cut out.

Fig. 2. represents the pins introduced, and the divided lip brought together.

FIG. 1.



FIG. 2.



The triangular piece being cut away, the assistant withdraws the piece of wood, on which the incisions were made, and holds the two portions of the lip, betwixt his fingers and thumbs. Then bringing them together and applying the surfaces accurately to each other, the surgeon introduces his first needle, about a fifth part of an inch from the surface of the lip, and rather towards the inner part of it; the other (for two are sufficient) is introduced in the middle betwixt this and the lower part of the cut.

The surgeon should now, put two or three turns of the ligature, about the pins, until the bleeding stops altogether. Then loosening it, he should more accurately wind his thread about the pins, by throwing the middle part of it over the two extremities of the pin, then crossing the ends under the points, so as to form the figure of 8. Having done this with the upper pin, he proceeds in the same way with the lower.

If the disease be in the angle, or commissure of the lips, then must there be made two semilunar incisions, terminating in an acute angle on the cheek.

In making the twisted suture, the lip is more frequently too firmly braced, than not brought together sufficiently. When the ligature is drawn to stop the bleeding, as in the first instance, and not afterwards loosened, but the operation thus finished, the swelling of the part makes the ligature much too tight, producing in consequence an irritation, which sometimes brings on suppuration, and bursting up of the wound.

But when after a short delay, which allows the bleeding to stop, and the parts which are in some degree already swollen, are brought accurately together. I have always found the operation succeed better, and without deformity.

When a great part of the lip is taken away, and when the surfaces meet with difficulty, there is a straining on the pins, and a consequent fretting of the wound. This is another cause of failure. It may be often prevented, by carrying an adhesive strap, from cheek to cheek, and bringing it over the lip betwixt the pins, or perhaps nearer the chin, so as to support the pins, but chiefly to act as a monitor, and to check the unwary motion of the lips.

The wound should be kept dry, and if possible without motion, that a scab may be formed. If a little matter should form, we are not to throw the parts loose, but let it out, with the point of a fine needle, and still retain the parts in contact.

On the fourth day, I take out the lowermost pin, (allowing the threads to remain if they will) first carefully washing the pin with a camel's hair pencil, and clearing it of the adhering hard mucus, or blood. When the pin is withdrawn, without the point being previously cleaned, it comes through with pain, and difficulty, and may even tear the new adhesions. After a slight suppuration has loosened the pins, they should not be allowed to remain, for they are in danger of deforming the lip.

There occur incysted tumours of the fleshy part of the lip, which nothing but the knife will remove. I have taken them out by dissection, rather than as the cancerous lip is cut. Stretching the lip over the finger of an assistant, and ex-



posing its inner surface, we can dissect out the tumour, without cutting its sac, and here as well as in accidental cuts of the lip, the edges will be best brought together by ligature.

## OF THE HARELIP.

THE operation for the harelip, is the same with that just described, only that in some instances the irregularity of the cleft lip, requires a more peculiar nicety in adapting the incision, so as afterwards to bring the parts accurately together.

Of the simple cleft we need say nothing further, than that the edges of it are to be pared off, with an uniform, firm incision, and then to be brought together, as we have described in the case of cancer. We first separate the lip from the gums, if they are adhering, then we may either cut the lip on a piece of wood, put in betwixt the lip and gums, or use the harelip-forceps, to hold the lip while the edge is cut off.



In this form of the disease also, there can be but one way of operating, although it is sometimes performed with difficulty.

The patient's head rests on the assistant's breast. The surgeon separates the lip from the gum, if it be necessary, then takes hold of the lip, of one side, with the harelip-forceps, leaving out from under their edge, what he means to cut off, and with one motion of the scalpel he cuts this portion off—Then moving his instrument to the other side, he places it so, that he may pare off the edge of that also, and bring the termination of the cut accurately up, so as to form an angle with the first.

The disadvantage of the harelip-forceps is, that they do not take a firm hold of the lip. They grasp unequally, and when the incision is but half performed, the lip is apt to slip from them—Sometimes the dryness of the lip in the first cut, gives a firm hold, while in the second, the forceps or lip, being bloody, they slip.

The pins are introduced as in the instance of cancerous lip, and the precautions are of course the same.

The operation may be done as successfully in an infant, as at the age of 14 years.

Sometimes the fissure of the lip is accompanied with a cleft in the palate, and a deficiency of the bones. When part of the maxillary bone stands projecting out of its place, it may in young subjects be violently pressed down, and made to adhere in its proper place. The deficiency of the palate will diminish, as the child advances in years.

On examining the bones of the face of children, with a cleft palate, I have found that the diminutiveness of the upper maxillary bone of the one side, was more apparent than real. The fissure is owing to the bone of one side, being thrust laterally, and of course made also to project somewhat. If this centre piece of the palate project irregularly, I have said it may be broken down, and forced into its place. But if the jaw-bone of one side be only pushed laterally, which is the most common kind of deformity, then I imagine by a compress operated upon, by an elastic steel bandage, coming round the head, the bones may be gradually brought into their places, so as to fill up the fissure of the palate. The cure may then be completed, by the usual operation on the cleft of the lips. Or the operation being done on the lip, the after treatment will be, to bring the pieces of the superior maxillary bone together.

#### ABSCESS IN THE FRONTAL AND MAXILLARY SINUS.

THE sinuses both of the frontal bone, and the superior maxillary bone, are subject to disease. The membrane of these

passages, always acutely sensible and subject to inflammation, becomes either from such general inflammation as we see in catarrh, or from injuries, or the neighbourhood of disease, the seat of a more confirmed disorder, and of suppuration.

In the frontal sinuses inflammation is attended with dull heavy head-ach, and pain, in the part. The pain is more severe on stooping; the integuments over the sinuses are swelled, and puffy. The patient is sensible of a peculiar offensive smell, and it will probably be found, that at intervals, there has been discharge of matter from the nose. All this may be, and still we must use general remedies, nor think of performing so formidable an operation, as applying the trepan, on the frontal sinuses. It is much more likely to be a common catarrhal affection, than a formidable disease, or it may prove merely head-ach, assisted by the imagination of the patient. But when there has been injury previously, when there are symptoms of a beginning affection of the brain, when there is occasional sickness, or much languor, or oppression, or any thing like epilepsy, or paralysis, a slighter indication will satisfy the surgeon of the propriety of an operation. If there be a collection of matter, and an inflamed sinus slowly affecting the brain, the delay of an operation may leave us full of regret.

If the frontal sinus is to be opened, we must proceed with all the precautions, which we should employ in the more common occasion of using the trephine.

1. We have to recollect the thinness of the outer shell of the bone. 2. The obliquity of the inner table. 3. The partition which divides the two cells. 4. We have to remember, that the lining membrane of the cells will probably be thickened, and that if diseased it looks like a suppurating brain, and has actually been mistaken for such! 5. That, when the trephine has taken out the circle of the outer table very neatly, the membrane will still be entire, and require to be opened with the lancet. The cure will then be conducted by emollient injections. No tents or dressings ought to be introduced into the cavity.

## PERFORATING THE MAXILLARY SINUS FROM THE ALVEOLI.

THE abscess of the maxillary sinus is marked by a colourless swelling of the cheek, over the bone, by a pulsating pain, deep seated in the cheek, generally fixed to the cheek, though sometimes extending over the whole side of the head, but not increased on pressure, by an oozing of matter by the side of one of the molares, sometimes by a discharge of matter from the nose. We find indeed that the most frequent complaint of our patients is that of foul matter flowing into their mouth, when they lie in bed.

We are to be careful to distinguish it from rheumatism tooth-ach and a nervous affection of the face. When it arises from tooth-ach, succeeded by high inflammation, or comes after fever, or succeeding to injury of the bones of the face, or has any such ostensible cause, it is favourable; and by the drawing of one of the molares, or perforating the sinus, and thus allowing a free exit to the matter, the disease will be cured.

All the treatment necessary in this disease, is to draw the second molaris, and then to pass up a stilette of the size of a writing quill, into the sinus; nature seems to point out that this is the better place for perforating, though it be sometimes done just above the alveolar process of the molares. The objection to this last place is that without taking away a piece of the gum, it is difficult to keep the perforation open.

If the perforation be made in the side of the sinus, then the instrument, which makes the hole for the point of the trephine, will answer.

When a patient presents with the sinus opened, and the matter running from it, the operation having been done some time before, we are not to despond, but to enlarge the opening for it has probably been made too small.

After the operation the swelling may require fomentations, or astringent washes. When the swelling has subsided, and



the discharge remains foetid, the patient can force the fluid from the mouth into the cell by the tongue merely\*.

If in this disease there should form an ulcer on the cheek, or just under the orbit, the disease is still to be relieved, by the operation performed below, since that opens into the floor of the antrum while the attempts to preserve the opening on the cheek, and to throw in injections there, will increase the deformity, even if they should be in the end successful in curing the disease.

#### WRY-NECK.

IN the case of wry-neck, which is submitted for operation, the mastoid process, is as it were drawn towards the sternum, the head is inclined to that side, and the chin is pitched up. On examining the cause of this, the mastoid muscle of that side, will be found to be smaller than that of the other side; it feels stringy and hard; it will not stretch when the muscle of the other side acts so, that it suddenly checks the turning of the face towards the same side.

The disease of the muscle which occasions this, is a very singular one. The muscle is changed into a firm substance, which to the knife cuts like gristle, and which is equally incapable of contraction, or stretching. I have chiefly seen the portion of the muscle which arises from the sternum, diseased in this manner; it would appear that to others the clavicular portion, has oftener presented thus changed in its texture.

In one instance I traced this disease, to a fall, and twist of the neck. One cannot imagine a more likely cause of this disease, than a strain upon the muscle. I have seen a similar disease, in a portion of the biceps cubiti, producing the effects of an anchylosis, in fixing the elbow-joint.

The only thing that the surgeon has to consider deeply is, whether the twist of the head proceeds from this disease or not. Whether the vertebræ have not greatly suffered, or it

\* Tincture of myrrh, and a little camphorated spirit diluted, is the best when the discharge is foetid.



may be, there is almost an anchylosis of the cervical vertebræ. We have to see that there be no paralysis of the muscles ; of the opposite side, rather than a permanent induration of this. If the distortion proceeds from a contraction of the skin of the neck, it will be sufficiently apparent, and distinguishable.

#### OPERATION.

THE patient may be supported upright on a chair, then examining well the tract of the stringy part of the muscle, an incision is made two inches and a half, or three inches in length, through the integuments over this diseased part of the muscle. This will be found to carry the lower part of the cut, within an inch of the sternum.

Having cut down fairly to the surface of the muscle, the muscle is to be relaxed by moving the face to the contrary side, and then the finger, or the handle of a knife or hook, is to be insinuated behind the contracted and diseased part of the muscle. This part is to be cut across by successive lesser cuts, the handle of the knife, or hook which is under it, guarding the parts below ; or a directory is introduced, by which the knife is guided under the muscle, when the diseased part of the muscle is divided by drawing the knife outward ; the part as I have said, cuts firm like a tendon or cartilage. When the whole diseased part is cut across, the patient feels as if a cord which had long bound down the side of his head was cut across ; he can turn the head towards the other side, but he brings it round again with more difficulty, and for a time the position of the head is awkward.

Now we will see the advantage of the first incision, being in the length of the neck, for the more we make the patient hold the head towards the other side, the closer the lips of the wound are drawn, though the space betwixt the cut surfaces of the muscle be considerable. I have not found the bandage to be necessary, during the cure of young people, the antagonist muscle answering the purpose ; but if after a long con-

tinuance of the disease, there should be such a change in the form of the vertebræ, that it requires the continued operation of a bandage, then a roller is to be put around the head, and brought over the opposite ear, so as to come down forward and pass under the arm-pit.

If the distortion be owing not to the rigidity of a particular muscle, but to a more general defect of the muscles of the side of the neck, or to general thickness, and induration of the integuments, we must be contented with the trial of such remedies as friction, with mercury and camphor, and the use of the bandage, electricity, &c. If the cicatrix of the skin should be the cause, it is advised that it be cut through, and the head kept in an opposite direction. It is a very troublesome business, and I would rather endeavour perseveringly to relax the contraction of the skin, by giving motion to the head, and here emollient embrocation may also be recommended.

## OF THE CATARACT.

THE cataract is the crystalline humour of the eye, become opaque. It is characterized in the beginning by these symptoms. The person has a haziness before his eyes, he thinks he sees black specks or flies, or streaks of black moving before him, the vision is indistinct and rather diminished in strong light. Upon inspecting the eye, there is a whiteness and turbid opacity in the pupil. This is an affection not peculiar to any age, though more common after the middle age. Sometimes it comes suddenly, though oftener very gradually. It may arise from inflammation, in some rare cases it has been dispersed by a casual inflammation. Sometimes there is only a cloudy opacity to be seen in the pupil, oftener the whole pupil is of a greyish colour, or it is of a deep milky whiteness.

When the cataract comes as a consequence of a blow, or of inflammation, it ought to be a reason of delaying the operation, as long as possible, for these opacities will sometimes spontaneously disappear.

The following circumstances previous to the operation, have to be attended to. 1. Is the patient though blind, still sensible of the variations of light, does he distinguish when an opaque body is passed before his eyes, or can he distinguish light from darkness? The reason of attending to this circumstance is, that we may discover if the retina be yet sensible, though the rays of light are with difficulty transmitted, through the opaque crystalline humour. 2. Is the iris still moveable? because if it still enjoys its motion, light being its only stimulus, and the retina being alone sensible to light, it indicates the sensibility of the nerve. 3. Further in the motions of the iris, we have to observe if the pupil remain perfectly regular. The irregularity of the pupil, may, most probably, be owing to some adhesion of the cataract, to the edge of the iris, and indicates to us, that there has been a deep inflammation there. The irregularity of the pupil, is an unfavourable circumstance, but not a total bar to the operation.

4. The cataract which has arisen from a blow on the eye, or after violent and deep ophthalmia, is, for the same reason, unfavourable. Since it is reasonable to suppose, that the membrane of the lens has been thickened, and has formed a firm adhesion to the surrounding parts. But fortunately the cataract is not often preceded by this inflammation.

5. When we look into the eye, to discover the seat of opacity. We look first nearly perpendicularly into the pupil, but then we must turn the patient's head gradually until we see the profile of the cornea; and now if the opacity should be caused by an effusion in the back part of the cornea, it is distinctly seen to be before the iris.

6. The deep black transparency of the pupil, and the want of motion in the iris, will sufficiently distinguish the amaurosis (the insensible state of the retina) from the cataract.

7. The cataract may be of a consistence firmer than the lens is naturally; it may be soft as cheese; it may flow liquid like milk, when punctured, but I know not how to foresee these distinctions by attending to the appearance of the cataract, before operation.

Surgeons of eminence, and oculists, still dispute this point, viz. whether the depression or extraction of the cataract, be the preferable operation. The depression of the cataract is done by introducing a needle into the eye, and removing the opaque lens from the axis of the eye. The extraction is a very improper term, but it means the making an incision into the cornea, by which the cataract escapes, being pressed forward by the vitreous humour. In the performance of these operations, the utmost delicacy is required, and they have a result the most interesting of any of the operations of surgery. Although the general opinion, at present, be in favour of the operation of couching or depressing the cataract, yet all I have seen makes me prefer the operation of extraction. I shall, however, describe the operation of couching the cataract, first.

## OF COUCHING, OR DEPRESSING THE CATARACT.

THE operation should not be performed on one eye, while the other is sound; and when both eyes have cataracts, though we have great temptation to operate on both, (by which on the whole we increase the chance of success) yet I conceive the operation should be done on one side only at a time. If the eyelids be much affected with a chronic inflammation, we ought to endeavour to correct this, previous to the operation. But if this is obstinate and habitual, and to no great extent, it makes no objection to the operation. No cross light must be admitted into the room; the north light is to be preferred, and it should strike obliquely on the eye.

1. The patient is seated on a chair, with a long upright back. A pillow is placed to receive his head; the assistant stands behind him to press his head upon the pillow, and in part to support it with his breast. A napkin is thrown over the other eye.

2. The assistant puts the points of his fore and middle finger, on the upper eyelid, and raises the eyelid, at the same time he gives a slight pressure to the eyeball, but rests his fin-



gers at the same time on the margin of the orbit, so that what pressure they give to the eye may be steady.

3. The surgeon sitting down before the patient, places his foot upon a stool of such a height, that when the elbow rests on the knee, the hand may be opposite the eye. Now with the fingers of one hand, he presses down the lower eyelid, and when he wishes to fix the eye, as he is about to introduce his needle, he pushes upon the eyeball with the point of his fingers. It is to be particularly observed, that any change of the degree of pressure on the eyeball during the operation, is to be made by the motion of the operator's fingers, the assistant has only to keep steady.

4. The surgeon having dipt his needle in oil, he takes it as he would a writing pen, he rests his little finger on the bone of the cheek, and he pierces the white part of the eye, in the middle betwixt the margin of the cornea, and the angle formed by the eyelids, the patient's eye being directed straight forwards. The needle should pierce the sclerotica in a direction perpendicular to the convexity of the surface, or, in other words, pointing to the centre of the eye.

5. The needle is now to be somewhat changed in its direction, and carried horizontally until the point appears behind the pupil, for it is to be observed that, although the opacity of the lens is considerable, yet the needle is seen through it, or when it is immersed in its substance. The flat surface of the point ought to be towards the iris, as the sharp edge might cut the iris.

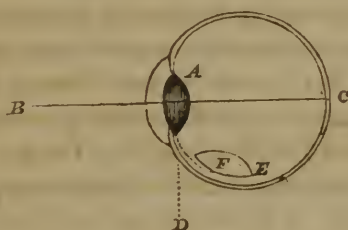
6. The first motions of the needle, I conceive, ought to be calculated to pierce and tear the anterior part of the capsule of the lens. And this for two reasons. Before the cataract can be displaced from its seat in front of the vitreous humour, its capsule must be broken, and this being done, by piercing it on the fore part, of course facilitates the descent of the cataract. Again, without this precaution, it happens that the cataract being couched, the fore part of the capsule remains, and in the inflammation which necessarily follows the operation, it becomes opaque, and forms what is called the mem-



braneous cataract. We have, therefore, to push the needle in a direction parallel to the iris, and get before the lens, then carry the point through the pupil, so as to burst through, or cut the fore part of the capsule.

7. Supposing that on the first touching the capsule of the lens, a white fluid escapes, and makes the aqueous humour turbid, we are not on this account to despair of success; for this milky and dissolved state of the cataract promises a quick absorption, and restoration of vision. It is our business in this case to tear the anterior half of the capsule, as widely as we may, without hurting the iris, and to plunge the needle repeatedly into the cataract, and then to tie up the patient's eye as usual.

8. Having torn the capsule, the surgeon withdraws the needle a little, and puts it over the cataract, or pierces the cataract high on its disk. Now the point of the needle is to be depressed, by raising the handle of the instrument; but at the same time that the point of the needle is depressed, carrying the cataract with it, it must be moved backward.



For example A, being the lens in its natural situation, to remove it from the axis of the eye, or course of the rays of light B, C, it is not to be pressed directly downward in the line D, but in the circular line E, which answers to the concavity of the coats, and by this movement it will be carried down and lodged at F.

9. When by raising the handle of the needle, the operator has carried the opaque cataract thus below the level of the pupil, and the pupil is clear, the operation is not done, for

in all probability, the cataract has not escaped from its capsule, and, on withdrawing the needle, it will rise again. He therefore would have to blame himself, if, having withdrawn the needle from the eye, he saw the cataract again forced up, and take its place behind the pupil, for the operation would be still to do. When, perhaps after repeated efforts, he has sunk the cataract out of sight, he must cautiously withdraw the needle from its hold upon the cataract, but not altogether upon the eye; then, if the cataract does not appear in the pupil, the needle is to be slowly withdrawn.

The fact is, that when the needle has carried down the cataract, the cataract is not yet unseated from its capsule, and instead of being separated from the vitreous humour that body has revolved with; by the elasticity of the membrane it will resume its former relation, and of course carry up the cataract, so as again to present it in the axis of the eye. But the cataract may have been separated from its connexions to the fore part of the vitreous humour, and yet rise in a partial manner, on withdrawing the needle; this is, because it had not been so forced into the vitreous humour, as to break on its capsule, and make a lodgment for itself; the elasticity of the vitreous humour throws it out again. It is incorrect to say, that the cataract has been buoyed up, since it is specifically heavier than the vitreous humour.

There is a possibility, that the cataract may escape from under the pressure of the needle, and pass through the pupil, into the anterior chamber of the aqueous humour. If the whole or part of the cataract escape thus, we ought to let it remain; it will dissolve in the aqueous humour, and be finally absorbed. The cataract may start backwards, too, so as to be deeply immersed in the vitreous humour. I have seen it faintly shining half an inch behind the pupil. I fancy this is not a frequent accident; if it should happen, we are to do no violence in endeavouring to remove it, as we are assured it will dissolve, since it must, in this case, be freed of its capsule.

10. It is a more difficult thing to fulfil the intention of the operation, when the cataract is soft or cheesy, for when the needle is pressed upon the cataract, the needle passes through, without dislodging it from its place, nor does the matter flow out from the capsule.

We ought, in this case, to break, or burst through the capsule, and, as freely as possible, admit the aqueous humour through the anterior part of the capsule; and a second intention ought to be to break down the cataract, which is increasing the chance of its dissolution afterwards. By perseverance in pressing with the broad edge of the needle, without injury to the eye, it will often be possible to remove the cheesy matter from the centre of the pupil, so that afterwards the patient shall see a little.

11. If there be an adhesion of the cataract to the iris, we shall discover this by the irregular figure which the pupil assumes upon the variations of light, admitted to the eye. During operation, if the depression of the cataract should disorder the regular circle of the pupil, it is owing to an adhesion, and we must endeavour to separate the cataract, and iris, by the edge of the needle, before we attempt finally to depress the cataract.

12. If after a few days the eyelids are opened, and there appear any fragments of the cataract, they are again to be depressed, or pushed before the pupil by the needle; but this is not to be done until the inflammation and irritability, the consequence of the first operation, have entirely subsided.

13. The remains of opacity behind the pupil, may be what is termed the membranous cataract. To tear away these shreds, and to push them below the level of the pupil, or through the pupil into the anterior chamber of the aqueous humour, a needle should be used so curved near the point, that by merely rolling the needle, betwixt the finger and thumb, the point of the needle may be moved pretty extensively. With such a needle the operation may be done with less violence, and a smarter motion may be given to the point

of it, than where, in order to give motion to the point of the needle, we have to raise the handle.

14. Any portion of the cataract, or any shreds of the cataract, or its capsule, which are accidentally pushed into the anterior chamber of the aqueous humour, are to be allowed to remain there, for they will be dissolved, and carried away by absorption.

15. The secondary cataract is the opacity of the remaining capsule, which is not carried down with the opaque lens, but remains in its situation. The secondary cataract may be perfect or partial. It may be said to be perfect when the lens has escaped from the back part of the capsule, and has been immersed in the vitreous humour, without the anterior half of the capsule being torn from its connexions to the ciliary process, or rent in any way. This is more apt to take place, than we at first would imagine likely, from the greater tenuity of that part of the capsule which is towards the vitreous humour, than the anterior portion of it. The imperfect, or partial secondary cataract, is the remaining shreds of the anterior part of the capsule. It is an opinion, that only the anterior part of the capsule is liable to become opaque, and I think this is very likely ; there is a foundation in anatomy for supposing that the anterior, and posterior part of the capsule of the lens, are of a different nature. It is this conviction, that the fore part of the capsule is most frequently opaque, and that it is the most liable to be so after the operation, that induces us to be careful to pierce, and break down this fore part, before couching the opaque lens.

If this has been done, only shreds of opaque membrane can be visible in the pupil, after the operation. And if they appear, we ought to let them remain for some time, in the expectation of their wasting, and acquiring transparency again. I have seen, on dissection, an opaque spot on the back of the capsule, and therefore I am forced to say, that the secondary cataract may be in the posterior segment of the capsule of the lens. But whether the opacity be in the back, or fore part of the capsule, is of little consequence, since it cannot be distin-



guished in the living eye, (because the vitreous humour forces the back part of the capsule into contact with the iris, after the depression of the lens itself,) and happily it is of little consequence to know what part of the capsule is thus diseased, as this supposed distinction would make no variation in the practice.

16. In operating for the membranous or secondary cataract, the intention with which we use the needle may be somewhat varied. We first endeavour to tear down the opaque membrane, and to place it under the level of the pupil, or we may attempt to gather the shreds of the membrane together, to loosen them from their natural attachment, and to push them through the pupil, into the anterior chamber of the aqueous humour where they will be dissolved and absorbed. We ought not to be too persevering in our attempts to clear the pupil of the membranous cataract at once, on the contrary we should be careful to do little injury, so that we may avoid raising inflammation. We repeat the attempt after a time. The needle should be very fine, and curved at the point, not like that which is adapted for pressing down the cataract of the body of the lens.

#### OF THE EXTRACTION OF THE CATARACT.

THE extraction of the cataract, I allow to be a more formidable operation than couching ; but when it is well done, it is more uniformly successful. I do not know that it is more difficult to perform extraction, than it is to perform couching ; but the blunders in this operation are at once apparent, while in couching the errors are concealed ; and even the initiated cannot precisely say from the motion of the hand, whether the operator be, with delicacy and niceness of intention, removing the opacity from the pupil, or making unmeaning, and consequently, unsuccessful motions of the needle.

Freedom from tumefaction and inflammation of the eyelids, and of all tendency to ulceration in their edges, or to opa-



city in the cornea, is more essentially necessary, previous to performing the operation of extraction, than of couching.

Extraction, let me say, is a bad term, as it indicates that the intention of the operation is to make an incision, and to pull out the opaque body. This idea is as dangerous, as it is incorrect. The principle on which the operation is done, is simply this. The coats of the eye are tense over the contained humours. Over the coats of the eye, are expanded the tendons of the muscles, while the eyelids have in them the fibres of the orbicularis muscle. The moment that the eye is wounded therefore, the humour escapes at that part. If an accidental wound be made on the white of the eye, the vitreous humour escapes in part. If the cornea be wounded, the aqueous humour escapes. But although the cornea be punctured, and the water escape, it does not fall flaccid. But the iris and the lens are pushed forward by the tension of the coats on the vitreous humour, and they take the place of the aqueous humour. Should the cornea not be punctured merely, but cut with so wide a wound, as to allow the lens to pass, the pressure on the vitreous humour by the coats and muscles of the eye will be so great, that the lens will be thrown in through the pupil, and escape by the wound.

The operation to be performed, then, is not to extract the cataract, as we speak of extracting the stone from the bladder; but only to make such an opening in the cornea, as to allow the cataract to be forced out by the tension of the coats of the eye, which is continual; or by the action of the muscles of the eye. The necessity of attending to this principle during the operation, I hope will be presently evident.

#### INSTRUMENTS.

If the operation is successfully done, no other instrument need be used, but a knife, of a form somewhat peculiar, and adapted to make the proper incision of the cornea. The knife

is of the form seen in the succeeding marginal plate p. 45. The point must be very sharp, the back straight, not sharp, and yet not thick; the curved edge very sharp, and the middle of the knife the thickest, and strongest part of it; in the first place, that the knife may have strength to be pushed through the cornea, and in the next place, that it may effectually fill up the wound as it is pushed forward. The broadest part of the knife must be fully two thirds of the diameter of the cornea.

The incision is made, by passing the point of the knife through the cornea, and across the fore-part of the eye, with one uniform motion, and the point entering on one side the cornea, near its attachment to the sclerotica, transfixes the opposite point, and being still carried forward, the lower edge of the knife cuts freely through the whole lower segment of the cornea, until it is disengaged. But if the breadth of the knife be not sufficient to make its way out, when thus uniformly pushed onward, the edge requires to be pressed down; an incision larger than the knife can fill up is consequently made, the aqueous humour escapes, and the iris is pushed forward on the edge of the knife! A little oil should be on the point of the knife.

To suspend the eyelid, and in some degree to fix the eye; the wire speculum is best in the hands of the assistant; the pressure to fix the eye must be made by the tips of the surgeon's fingers, at the same time that he holds down the lower eyelid.

A gold needle is among the apparatus of the oculist. The use of this is, to break or cut the capsule, when after cutting the cornea, that membrane strongly resists the effort of the muscles, to protrude the lens. The point should rather be rough than sharp, whether it be made of gold or of any other metal, is of little consequence.

Forceps too are necessary, and they must be of such a form and niceness, that we may introduce them under the flap of the cornea, and seize any shred of opaque membrane, that may present in the pupil.

For the same purpose, and to extract any broken piece of the cataract that is detained, a very delicate hook is to be provided.

The cornea scissors are absolutely necessary too, to increase the incision of the cornea, if it shall be necessary, or to separate any protruding capsule. A fine probe will be found convenient to replace the prolapsed iris, when it shall have fallen out from the incision. Such a probe will also serve to dilate the pupil, if it be necessary ; but of this, we will speak presently.

#### OPERATION.

THE patient is seated on a low chair ; the surgeon is seated opposite to him ; the light must be steady, and without glare. A cloth is put over the other eye. The surgeon turns the patient's head until the light falls a little obliquely on the eye to be operated upon ; the depth of the pupil, and its nearness to the cataract, is then distinctly seen.

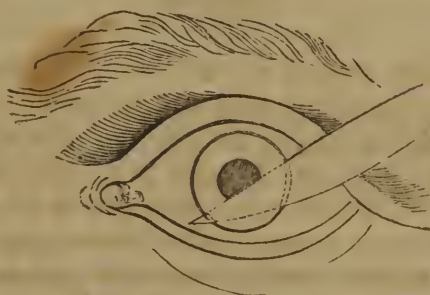
1. The assistant standing behind the patient brings his breast so as to support the back of the head ; puts his left hand under the chin, and with the right taking the speculum of Pelier, he raises the upper eyelid by pressing in the integuments of the eyelid, betwixt the eyeball and the margin of the orbit.

2. The surgeon, with the tips of his fingers, presses the lower eyelid against the eyeball, so as to fix it ; the margin of the eyelid is at the same time carried down so that the cornea stands prominent. The other hand holds the knife. He rests the elbow on the knee, the little finger on the cheek-bone.

3. When the eye is steady, the point of the knife is made to pierce the cornea, within half a line of the sclerotica, and on the outside and a little above the middle of the cornea, the flat side of the knife is towards the eye, its straight back upwards. The knife is now carried in a direction towards the nose, and at the same time downwards. The nicety of

this part of the operation is to carry the knife uniformly forward, to press in that degree which will keep the eye steady, and yet so to manage the pressure, that the aqueous humour does not escape by the side of the knife.

4. The point of the knife is made to pass over the lower half of the pupil, and enter the opposite side of the cornea, at the same distance from the sclerotic coat, as where the point first entered. Now, being carried uniformly forward, the lower edge of the knife will cut the lower segment of the cornea, at the distance of half a line from its connexion with the sclerotica.



The knife is here represented, passed, not directly across the eye, but entering near the margin of the cornea, a little further up than usual, and the point coming out a little lower.

The intention of this is, to prevent the eye from turning towards the nose during the operation ; which it is very apt to do, when the knife is pushed directly from without inward. Although in pushing the knife in this direction, the eyeball should be turned as much downward, as in the other way it would be inward, yet, when the eye is turned downward, we can better proceed with the operation, or more easily turn the eye to the proper direction.

When the eyeball moves before the knife, we must suspend, as it were, the progress of the knife, but not in the slightest degree withdraw it ; we wait a little for the ceasing of the spasm, and then with the knife, bring back the eye to its original position. Often, I may say, the oculist distracted by



this simple accident, brings out the point of the knife too soon, and instead of making a semi-circular incision of the cornea near its margin, makes a cut, terminating nearly in the middle of the cornea, thus :



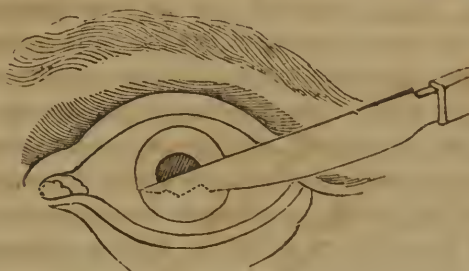
A. The proper course of the incision, marked by a dotted line. B. The course which the knife has taken in cases, where I have seen the operator embarrassed, by the eye turning inward.

5. It is to prevent this motion of the pupil towards the nose, that practitioners have exerted all their ingenuity, to form a speculum to fix the eye. The first objection to the use of the speculum, is, that it engages the hand of the surgeon, when he should have his finger free, to press upon the surface of the cornea ; and secondly, that the speculum operating by pressure on the eye, is apt to force the aqueous humour out, before the incision is completed.

6. Some oculists have recommended, that the capsule of the lens, should be punctured, before the incision of the cornea be completed, *viz.* as the knife is carried through the anterior chamber of the aqueous humour, they depress the point into the pupil, to pierce the capsule. But this is a practice not to be imitated, as the advantage of it, bears no proportion to the danger. The consequence of this manœuvre, too often will be, that the aqueous humour will escape ; then the iris will press forward on the edge of the knife, and the incision cannot be completed with the knife.



7. If by any accident the aqueous humour should escape, and the margin of the iris should fall before the edge of the knife, in this manner, we cannot then carry forward the knife.



This accident requires calmness. We know how it has happened, and this knowledge teaches us to remedy it. A little of the aqueous humour has escaped, and the iris is pressed forwards: we must restore the equilibrium then, by pressing gently on the cornea. This throws back the margin of the iris behind the edge of the knife, and again we can carry the knife straight forward\*.

8. But if the aqueous humour, has escaped in such a quantity, that the iris has come in contact with the cornea, and lies before the edge of the knife, we cannot finish the section of the cornea with the knife. The point of the knife must be withdrawn a little, and brought before the edge of the iris, and made to pierce the cornea lower down, than would be necessary to make an incision of due extent. By this change of the direction of the knife, we have made a section of the cornea, without injury to the iris, but it is not of sufficient size to let the cataract pass, we must therefore have recourse to the scissors to enlarge it.

9. When we have made the section of the cornea too small, and the lens or cataract does not come spontaneous-

\* Baron Wenzel and Mr. Ware, give the direction to rub the cornea, as if there was a sympathy betwixt the cornea and iris: but as I have not been able to ascertain that any connexion subsists betwixt the rubbing of the one, and the contraction of the other, I have given this intelligible reason for *pressing* the cornea.

ly forward, we must insinuate one of the blades of the fine scissors under the flap of the cornea, and enlarge the incision.

10. I shall suppose that the section of the cornea has been duly made, and the cataract does not immediately follow. Some oculists have recommended that we introduce a curette into the pupil, and enlarge it. This is an ignorant way of dilating the pupil. We ought simply to shut the eyelids, and cover the eye with the hand, so as to relieve the excitement of the eye, and by excluding the light the pupil will be dilated, and ten to one but the cataract will be seen coming from under the eyelids, on lifting up the flap of the cornea.— If the cataract be still retained, then it is not the contraction of the pupil which prevents its discharge, but a particular strength in the capsule. And now the gold needle, or some such instrument, must be passed under the flap of the cornea, and into the pupil, to break or puncture the capsule, when the cataract will be discharged.

11. The Baron Wenzel and other oculists who have gained dexterity by practice, without ascertaining the principle, have asserted that “ The incision of the cornea is not the most difficult part of the operation, and that it afterwards requires much dexterity as well as judgment successfully to *extract* the cataract.” All that I know of the structure of the eye, and what I have seen of these operations, and the difficulties I have myself experienced, contradict this opinion. The successful incision of the cornea is the operation, and all the untoward circumstances that may trouble the operator, have their source in the imperfection of the section of the cornea, or from some previous disease of the eye, as for example, the thickening of the membranes, or the adhesion of the capsule of the lens to the iris, &c.

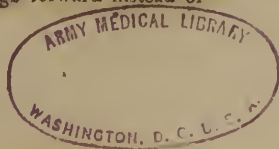
As soon as the knife has cut itself out, the upper eyelid should be allowed to fall; for the uniform support of the eyelid prevents the cataract from being thrown out too quickly, or the vitreous humour from following it, if it should escape before the eyelid can be closed. If upon raising the eyelid the lens does not make its appearance, the capsule is to be

punctured, and the eyelids again closed to allow the pupil to dilate. If it does not now come forward, the small probe is to be introduced under the flap of the cornea, to examine if the incision be large enough; for, from the thickness of the cornea and the oblique direction of the knife, the incision of the cornea may seem to be of sufficient length on the surface of the cornea, when the knife has not penetrated to the inner surface nearly to the same extent: if the incision should prove too small, it must be a little enlarged with the scissors, as I have said. If the cataract does not now come out spontaneously when the incision is evidently sufficient, and when the capsule is punctured, we are forced to press the eyeball.

12. We ought not to press the eyeball if it can be avoided; for there being a difficulty in forcing the cataract through the pupil, when that difficulty is overcome the vitreous humour is apt to follow the cataract; and often it will happen, that the vitreous humour will escape without the lens being discharged. By this pressure the lens is not carried through the pupil, but only the edge of it is protruded, and the vitreous humour escapes under it, while the firmer cataract is retained\*.

13. When the iris is cut by the edge of the knife, no pressure must be made on the eyeball, or the vitreous humour will escape while the cataract is retained. When the pupil is of its natural form, and the iris entire, the cataract presents behind the pupil, and no part of the vitreous hu-

\* Thus we find the Baron de Wenzel describing a thing which should never be seen—"The cataract did not give way to the gentle pressure that is usually found sufficient to dislodge it. Its upper edge repeatedly advanced into the pupil, and sometimes almost came through it," &c. Every time the crystalline advanced, a small bladder was perceived on its posterior and inferior edge, strongly adherent to it, and formed by the hyaloid membrane, &c. To press the eyeball in such a state of the lens, and the bladder which is here described, is out of all rule. The bladder is simply the vitreous humour pushing forth under the lens or cataract, which has turned its edge forward instead of being carried bodily through the pupil.



humour escapes before it is protruded, but when the iris is cut, the vitreous humour being softer, is carried through the slit of that membrane, and the lens is only turned a little, but not unfixed, and pressure may force out all the vitreous humour before the lens will come. By inattention to this consequence of the iris being cut, I have seen a great part of the vitreous humour lost. If the iris be cut, we should then indeed extract the cataract by piercing it with the crooked needle; unavoidably, I am afraid, some part of the vitreous humour will escape.

14. When there is a detention of the cataract by adhesion, it is recommended that we should carry the golden needle all round the cataract, and in different directions, to separate these adhesions. This appears to me as absurd as dangerous. The adhesion is betwixt the capsule and the ciliary processes and iris; we have then only to pierce the anterior part of the capsule, to open it freely, if it be very tough, and then the cataract is discharged, for there is no adhesion betwixt the capsule and the cataract\*. If, after the discharge of the opaque crystalline or cataract, opaque membranes fill the pupil, we may be tempted to extract them; but if the anterior part of the capsule of the lens be

\* "After the cornea and capsule had been properly divided, my father found that the cataract did not come through the wound on his making the usual pressure. He was therefore obliged to introduce the needle and carry it in different directions round the crystalline, in order to destroy the adhesions it had formed to the posterior parts of the iris. This part of the operation took up at least fifteen minutes." This is the recommendation of the Baron de Wenzel, his son, and the commentator, Mr. Ware.

On this account we first ask ourselves, why was the capsule punctured, but that it might burst freely open, and allow the cataract to escape; and if the cataract did not escape, was it not owing either to a bad incision, or if that is not likely in so dexterous hands, to the strength and toughness of the capsule; why therefore was the intention of the operation changed; why, because the lens would not come forth, and drag the capsule with it? To have cut the capsule freely open, and to have dilated the pupil, was what should have occurred to us as proper to be done.



ruptured, though the shreds of that membrane may be visible, (owing to their opacity), yet I conceive we have nothing farther to do, but to close the eye. By holding the patient's eye thus exposed to the light, and introducing instruments under the cornea, we excite spasm in the muscles, and as the membranes we are tearing away, are connected with the vitreous humour, it is scarcely possible in this attempt to avoid losing much of that humour.

If the anterior part of the capsule be opaque, the lens having burst through it, it will, I imagine, be better to let it take the chance of wasting in the aqueous humour, than by tearing it away to endanger the entire loss of the organ, in consequence of the discharge of the vitreous humour.

15. When the cataract is discharged entire, we ought to have little further anxiety, I imagine, that to see that the iris does not hang relaxed into the incision of the cornea; as light contracts the pupil, so will opening the eyelids make the relaxed iris draw up; but if it be at all engaged betwixt the edges of the cornea, it will require to be replaced by insinuating the small probe into the incision.

16. When the operation is finished, we must see that the edges of the incision come accurately together, then the eyelids should be closed, and some plies of wet lint, hung before the eye; the clothes must not press much upon the eyelids. Before putting the patient to bed, we must see that the margins of the eyelids are properly together, and that none of the eyelashes are turned in upon the eye. The eyelids should be looked to the next morning, and if necessary, bathed and cleaned of any secretion; the eye should be examined carefully on the third day, but the eyelids instantly replaced, and the patient enjoined repose and darkness for ten days.

17. It is, in my opinion, entirely out of the question, to perform the operation of extracting the cataract a *second time*. If there occurs any necessity for removing a remaining opacity of the pupil, after the crystalline humour has



been discharged, and the incision of the cornea healed, it must be done by the needle, as practised in couching.

OF INFLAMMATION OF THE EYE, AND OF THE TREATMENT AFTER OPERATION.

THE eye is necessarily the most delicate structure, and exposed more than any similar part of our frame. The natural delicacy and transparency of its membranes are preserved in a manner truly admirable. The tears which wash its surface, we must have observed, are acrid and stimulating, and when they run over the cheek, inflame and excoriate the surface. But the delicate surface of the eye and eyelids are accommodated to the presence of this fluid, and the advantage resulting from this is, that the surface is not disordered or irritated by any lesser degree of stimulus, and consequently it bears the variations of the atmosphere, and the excitements it is necessarily exposed to.

Yet when we consider the exposure of the surface of the eye, and the delicacy and vascularity of its membranes, we cannot wonder that it should be often inflamed, and often suffer from those derangements of the constitution which are not to be remarked but by some such local affection as chronic inflammation of the eye.

I see chiefly these distinctions in the inflammation of the eye: 1. An acute inflammation, with evident symptoms of constitutional derangement, marked by nausea and a furrowed tongue, or accompanied with inflammation of the mucous membrane of the nose, and sinuses, and symptoms of inflammatory fever; or an inflammation similar in symptoms, but most commonly resulting from outward impression. 2. A lower degree of inflammation, chronic, and resisting local remedies, which is resulting from some derangement of the system. 3. Lastly, an inflammation only resembling the others in appearance, the effect of local debility in the eye, and characterized by a relaxed state of the vessels, and a

fulness of the membranes, the consequence of a preceding violent inflammation.

1. In the first example, while the inflammatory action is to be subdued, all that will excite, is to be removed in the first stage; every surgeon of good practice forewarns us to notice well that change which takes place, when instead of the violent throbbing, the acute pain, and hot watery discharge, there is only a swelling and turgescence in the membranes, with a diminished irritability, the eyelids more flaccid, the fieriness being gone though the redness remain, and the pupil be more dilated; now the evacuations, the soothing and emollient applications, which were necessary at first, will only continue the symptoms, and tend to fix the complaint, while cold stimulating and astringent applications, are to be employed.

The mere consequences of violent ophthalmia, and which are not to be considered as fixed or peculiar diseases, are the *phlyctena*, which are small vesicles formed on the surface of the eye; the *chemosis*, which is the swelling and projection of the conjunctiva; the *puriform discharge* from the eyelids, (which when in a remarkable degree, I am inclined to believe is always owing to matter communicated to the eye); the *hypopion*, which is a deposition of coagulable lymph in the anterior chamber of the aqueous humour; the bursting and total destruction of the eye; all these, as sure consequences of the high inflammation, are to be prevented or cured by removing the inflammation. But the several diseases I have now to mention, as requiring operation, we may better consider as the consequences of the continued chronic ophthalmia, and which from the slowness of their formation do gradually acquire a kind of constitutional permanency which requires excision.

I may say once for all, what I conceive to be necessary in the examination of these diseases, in order to discover if any thing should be done previous to operation, and what treatment is to be pursued after the operations upon the eye, when inflammation is a consequence.

When any new membrane seems to be formed on the eye, any pustule, ulcer, or opacity, accompanied with clusters of turgid veins, or a general relaxation and fulness of the vessels, before taking the knife to these, we ought to examine if any accidental cause has existed which is now happily removed ; or whether or not by the foulness of the tongue, the want of appetite, the languor and sickness, the occasional rheumatism in the face and head, or head-ach, or any such slight affections, there exists derangement in the system, or debility and consequent accumulation in the stomach and bowels. We must examine well whether the local disease partakes of the character of scrophula or syphilis.—The influence of these causes ought, if possible, to be removed before operating on the eye.

Previous to an operation the patient should take a smart purge ; from the immediate debility proceeding from this he ought, however, to be recovered. The immediate effect of a severe or protracted operation on the eye will often be a nervousness and sickness, or coldness, shivering, and head-ach ; this state an opiate with an aromatic will remove, and as it will often happen, that the irritability of the stomach will prevent the medicine from being retained, if the opiate be given in the form of clyster to the quantity of what would be a double dose if taken by the mouth, it will cause the commotion and sympathy of the frame with this most irritable organ to subside.

If blood flows from the eye in consequence of the operation, it is to be promoted by bathing the eye with tepid water. After all operations on the eye the patient must be condemned to darkness, and low diet ; a wet rag be put on the eye, the bowels must be kept open. He must not indulge in bed, nor lie with his head low, nor have his head and eye loaded with bandages and dressing. Opiates should be held in reserve as long as may be. That inflammation which proceeds from the stimulus of the knife, should be treated with emollients, and the eyelids washed with tepid water. The astringent collyria should be reserved for that stage when there re-

mains not the smart action of vessels, and the acute sensibility, but, on the contrary, a relaxed state of the parts only. There is a niceness of observation necessary, to be able to say when the operation has ceased to produce its effect, when it may be repeated or when a caustic may be applied to assist in the cure, supposing an excrescence or tumour has been cut off. Even after this effect of the mere irritation of the knife might be expected to have subsided, there will often come on symptoms of general disorder, head-ach, and increase of heat, with restlessness and watching. But the tongue, the bitter taste of the mouth, and nausea, point out to us the necessity of gently moving the bowels; these symptoms will yield to quietness, low diet, and occasional clysters.

This lowness of diet, we must remember, is not to be the universal order, but observing when there is a tendency to high action, or irritability of weakness present, we must half starve some, and give more generous diet to others. Above all we must guard against the complaint being fostered and supported by confinement and bad air, low diet and despondence, for this reduces the system to that state which, though not actually disease, is particularly unfavourable to the cure of surgical diseases.

## RELAXATION OF THE EYELID.

THERE may be a difficulty of raising the eyelid, from an irregular motion and spasm of the orbicularis palpebrarum\*. There may be a difficulty of raising the eyelid, from a loss of power in the levator palpebræ superioris. There may be a relaxation of the upper eyelid, in consequence of inflammation long since subsided; a fulness of the cellular membrane, which prevents the action of the levator muscle. In this last case a portion of it may be cut off, so as to relieve the eyelid, which otherwise hangs over the cornea, and obscures vision.

\* An irregular nervous affection producing it, as in hysteria.



EVERSION OF THE EYELIDS. (*Ectropion*).

THE conjunctiva having been inflamed, there sometimes remains a tumefaction in the conjunctiva, with a weak chronic inflammation. The edge of the eyelid is turned outward, and there is a semilunar, pale, fleshy tumour betwixt it and the eyeball. The cornea sometimes appears sunk within a circular tumour. The eyelids no longer wipe the dust from the cornea ; they are removed from it ; the eye is hot, and the tears fall over the cheek, there being no longer the gutters left between the meeting of the ciliary cartilages, to convey the tears to the puncta\*, and there occur of course frequent attacks of more violent inflammation, and in the end an opacity or ulceration of the cornea takes place. In slight cases the tumours are only to be scarified, or the surface, (if it shall have granulated) may be destroyed with the lunar caustic. The object in both these ways is to produce a cicatrization and consequent contraction of the conjunctiva.

When the disease is more confirmed and the semilunar tumour of the conjunctiva considerable, the whole protruding part is to be cut off. To do this, it is seized with the hook or forceps, and with the crooked scissors it is to be cut off. After this a few touches of the knife may still be necessary, and during the cure the end may be further secured, by touching any prominent granulation with the caustic and by the use of astringent washes.

## OF THE INVERTED EYELID.

INVERSION of the eye is where the margin of the eyelids and consequently the eyelashes are turned inwards upon the eye, proving a continued source of irritation and inflammation.

\* There is a lesser degree of this disease, common to old people, which is not meant to be spoken of here.



No spasm or violent action of the muscles of the eyelids will produce this inversion, nor will the paralysis of the same muscles have any tendency to form it. It is one of the many consequences of chronic inflammation, which making, as it were, a permanent growth of the superficial part of the eyelid, while the conjunctiva remains contracted it follows of course, that the edge of the eyelid is turned in. It is then in all respects the exact reverse of the eversion, and tumour of the conjunctiva. But perhaps this position of the tarsus is not merely the consequence of a fulness of the cellular membrane, or growth of the skin, but in consequence of ulcers; the inner surface of the eyelid and tarsus may be contracted by the forming of the cicatrix.

The surgeon then has to determine by careful examination, whether or not the inversion be owing to the growth or relaxation of the outward skin and cellular membrane of the eyelid, and if it be, there is this method recommended of removing the evil.

With the finger and thumb a portion of the skin of the eyelid is raised, so as to hold a ply or double of the skin, parallel to the margin of the eyelid. In doing this the surgeon will be able to distinguish betwixt the skin and the muscle, and will of course be careful to avoid catching hold of the orbicularis muscle. The scissors are now applied so that an oval piece of skin, or rather a piece of the form of a myrtle leaf is cut out. The appearance of the eye is frightful, but first by means of an adhesive plaister, and then by a compress and bandage the skin of the eyebrow is brought down so as to allow the margins of the wound to approach. The cicatrix forming consolidates and gives firmness to the outward skin, so as to keep the cilæ from being longer inverted upon the eye.

But if this inversion of the eyelid be a consequence of ulcers and contraction of the inner and cartilagenous edge of the eyelid, forming a kind of stricture which prevents the inner edge from rising fully over the eyeball, and which drags in and inverts the margin of the eyelid, then a different ope-

ration is performed. Having forcibly turned out the inside of the diseased eyelid, the inner membrane of the eyelid, and the ciliary cartilage are to be cut across by the point of a lancet. If the inversion of the eyelid has arisen from the alleged cause, it will be immediately relieved.

#### OF TUMOURS OF THE EYELIDS.

THERE are tumours of the eyelids which the patient is very willing to have taken off, and which should be taken off because they push in the tunica conjunctiva, and pressing upon the eyeball, in the motions of the eyelid, they inflame it. These are small incysted tumours growing in the place of the meibomean glands, and it is natural to suppose that they are the enlarged glands.

But we must observe, that there are tumours of the eyelids which ought not to be cut. These are small tumours with a broad base, and of a dark red colour. Sometimes they have the appearance of a small boil, being white on the most prominent part: yet this is not pus\*. On the contrary, the tumour we have to cut out is colourless, only in as much as sometimes by exciting the eye there may be some general inflammation.

These incysted tumours of the eyelids, it is needless to attempt to remove either by local remedies, or by attention to general remedies, they must be cut out, or the patient must submit to the inconvenience; I must add, however, that there is more pain and bleeding than would be imagined to be the consequence of so trifling an operation.

The first thing to be examined is, whether or not the tumour be so united to the inner membrane of the eyelid as to force us to cut through the eyelid altogether, before we

\* *Hordcolum*. In this tumour of the eyelid we should do very little, unless it be to move the bowels. When, however, the little swelling advances, this white speck bursts and discharges a little fluid, and then a slough is seen within, which is by and bye pushed out, and the sore closes, to promote which, fomentation and poultices are used.

can take away the tumour, if we should operate by making our first incision on the outward skin. If the conjunctiva seems intimately united to the tumour upon our everting the eyelid, we have to proceed thus :

As in all operations on the eye, the patient is firmly seated, and an assistant standing behind him supports the head against his breast. 1. The assistant must invert the eyelid, by catching the eyelashes and margin of the eyelid with his finger and thumb, and turning his fingers, so that the fore-finger pushes forth the tumour and everts the eyelid. 2. The surgeon now draws his lancet pointed scalpel across the tumour, so as to divide the tunica conjunctiva in a direction parallel to the edge of the eyelid. 3. Having by scratching a little separated the membrane, so that the tumour is thrust out, he has to push a hook or small tenaculum into it, and then to dissect it away altogether.

But if the conjunctiva be not diseased or very firmly united to the tumour, we had better operate without everting the eyelid, and this is possible without leaving an observable scar on the eyelid.

1. The surgeon fixes the eyelid by pressing the two angles down by the points of the fore and middle fingers, and having stretched the outer skin of the eyelid over the tumour, he draws his knife directly over the tumour and parallel to the edge of the eyelids, consequently separating the fibres of the orbicularis, not cutting them across. 2. Having exposed the outward half of the tumour he pushes the fine tenaculum round under it, and then dissecting it a little more, he applies the curved scissors, and cuts it off from the tunica conjunctiva.

The orbicularis muscle holds the lips of the wound together, without our assistance, and then it is only required that we bind lightly on the eye a cloth wet with cold solution.

When tumours grow within the socket, they are to be early extirpated, for though they should be of a harmless nature, yet their increase, simply by pushing the eyeball forward, and

stretching the optic nerve, will cause blindness and deformity, while by filling the socket and pressing more and more on the eye, the operation of cutting them out becomes daily more difficult.

## ENCANTHIS.

THE Encanthis is a tumour arising from or at least involving the caruncula lacrymalis, it is of a pale red colour, and irregular on its surface; as it increases it draws into its substance the semilunar fold of the conjunctiva and stretches its root along both eyelids. When this tumour is of a darker hue and hard, and has lancing pains in it, and still more when becoming more active and vascular, it bleeds easily or ulcerates, it is becoming cancerous.

Even before the tumour shews this cancerous character there occur good reasons for cutting it off. When it becomes rooted in the eyelids, and the cancerous disposition has spread, nothing but the extirpation of the whole eye will avail, if even that is effectual. When the tumour is not of a malignant nature, and when it has only produced the lesser evil of a weeping eye, by its pressing the puncta, and caused inflammation of the eye, by preventing the eyelids from meeting, it may be cut out with more hopes of success. We may do it thus:

1. The assistant turns down the lower eyelid with his finger, or with the assistance of a flat and blunt hook; the surgeon then with a pair of nice forceps, and very sharp knife, dissects off the root which the tumour has shot along the inside of the eyelid.
2. The assistant then turns up the superior eyelid, when the surgeon in the same way dissects off the root of the tumour from this eyelid.
3. Now the body of the tumour is to be pierced with the hook and drawn outward, and if it should appear that the caruncula lacrymalis is natural and distinct from the tumour, then the latter is to be dissected off from the caruncula lacrymalis; but if they shall be incorp-



rated, the whole is to be taken away. 4. The last part of the operation is to dissect up the diseased conjunctiva from the surface of the eye-ball.

After the operation, the eye may be fomented until a considerable quantity of blood be lost, and afterwards emollient fomentations will only be required, if no cancerous affection has prevailed.

## OF THE PTERYGION.

THE Pterygion is a pale red film, which stretches generally from the inner angle of the eyelids, across the cornea. It is one of the pure consequences of continued inflammation. When this web covers the whole eye it is called PANNUS. But the terms film and web deceive us, for this is not a new membrane formed on the surface of the eye, but only a congestion in the cellular membrane, under the conjunctiva, which, as it were, loosens it from the sclerotica, at the same time that its vessels are increased in number, and become tortuous. This diseased state of the conjunctiva encroaches in a conical form on the lucid cornea: it is there too of the same nature; the transparent outer lamina of the cornea becoming opaque, and being at the same time loosened in its texture.

## OPERATION.

1. THE patient being seated with a cloth under his chin, the assistant stands behind him and supports his head, having in one hand a sponge full of tepid water, which from time to time, in the progress of the operation, he pours into the eye, as it becomes obscured by blood. The assistant opens wide the eyelids.

2. The surgeon now with very fine forceps raises the apex of the pterygion which is on the cornea; he then pushes the knife, used for the extraction of the cataract, under the fold of the membrane which he has raised; he carries the knife forward until the edge shall have cut itself out, and have separated the very apex of the membrane from the cornea.



3. Now holding the membrane up it is to be dissected a little from the white part of the eye, and lastly the scissors are to be applied (pointing upward or downward), so as to cut across the middle of the membrane, where it is attached to the albuginea.

The eye is to be now washed with tepid water, while the blood flows, and then a light compress of wet linen is to be put on the eye. The surface which has been diseased acquires a peculiar yellow colour; it is some weeks in contracting fully, and forming a cicatrix. The treatment after this is only such as would be prescribed to suppress any appearance of returning inflammation.

That part of the cornea from which the pterygion has been cut off, does never entirely recover its transparency.

#### OPACITY OF THE CORNEA.

1. THE cornea becomes opaque in several ways. Inflammation may leave in it a milky opaque spot or spots, from an effusion under the outward lamina. There is at the same time a flaccid state of the conjunctiva and tortuous or varicose veins lead to the opaque spot of the cornea. This has been called NEBULA, from its producing only a cloudiness in the vision.

2. If the cornea be opaque in consequence of a preceding very violent attack of ophthalmia, the effused matter will be found to be deposited deeper in its substance, and is supposed to be coagulable lymph; this is the ALBUGO.

3. Again, there occurs in consequence of inflammation, a postular opacity, which, breaking, forms an ulcer, which leaves a firm opaque cicatrix, viz. LEUCOMA.

The practice in the first instance of opacity (the NEBULA) is to extirpate the tortuous fasciculus of vessels, whose elongation over the cornea caused, or necessarily accompanied the formation of this opacity, and which we may now suppose, feed and support it as it were. The fine eye-scissors and a common housewife needle, stuck with its head in a piece of

wood, are sufficient apparatus for this end. The head of the patient is supported against the breast of an assistant, and the eyelids held asunder while the eyeball is at the same time pressed so as to steady it.

2. The surgeon passes the needle under the fasciculus of vessels, so as to lift them from the sclerotica near the margin of the cornea. He then places the scissors so under the needle as to cut out a considerable portion of the conjunctiva and the congeries of vessels. The eye is to be fomented so as to continue the bleeding from the cut vessels. The opacity of the cornea will often disappear the first or second day after the operation. When a young man asks how is this supposed deposition in the cornea absorbed, I cannot give him a satisfactory answer.

The practice in the more permanent opacities of the cornea, viz. the albugo and leucoma is very vague, because of the great difficulty of removing them, and the frequent disappointment in the attempt to cure them. All that is to be said, seems to resolve into this—if there be a remaining inflammation or laxity of the vessels of the eye, this is to be removed by local and general means;—if, on the contrary, all inflammation has subsided, and the speck is stationary, we endeavour to excite such an action in the part by stimulants, as may produce eventually some change in the disposition of the part.

#### APPLICATION OF CAUSTIC TO THE CORNEA.

ULCER in the cornea may be a consequence of violent inflammation, or a direct effect of external injury. It has been roundly asserted that the ulcer of the cornea is oftener the cause of the ophthalmia, which accompanies it, than the ulcer is a consequence of the ophthalmia. This teaches us not to trust to general remedies for the removal of the inflammation. The ulcer then is to be touched with the lunar caustic. This of course deadens the very sensible surface of the ulcer, and it being no longer sensible to the acrid stimulus of the tears, the irritation subsides.

The best way of applying the caustic is to have it set in a quill, and put on the stick of a pretty large camel-hair brush; the caustic must be cut down to a small point; a little milk is beside the surgeon, in which he dips the brush. He then raises the eyelids, and at the same time presses them to fix the eyeball, he touches the ulcer with the caustic, and presses it to the bottom of the ulcer, and when he has done this he brushes the liquified caustic from the eye with a motion of his brush.—In a day or two the irritability of the eye returns, for the deadened surface of the ulcer has separated, and the tears again come in contact with the sensible surface, but the pain and intolerance of light is less than before; it is to be touched again with caustic, with a more permanent relief of symptoms. And if things go on successfully on the clearing of the ulcer in successive times, instead of being eaten deep it is shallower, and fills up, and the inflammation subsides.

The caustic need not be applied after the irritability ceases, and the ulcer looks red and granulating, instead of being irregular and cineritious in colour.

#### OF THE STAPHYLOMA.

THE Staphyloma is an opaque conical tumour of the cornea, it is often of a white or pearl colour, sometimes dark or variegated by the accretion of the iris to it. The staphyloma is most generally a consequence of small-pox.

The opacity of the cornea produces blindness of that eye, but the worst circumstance of the disease is, that although it has no malignity, it is always liable to be aggravated, and to affect the other eye also. The tumour of the cornea projecting from betwixt the eyelids, remains dry, and becomes ulcerated; there is a continued inflammation of the eye produced, and from the intimate sympathy which exists betwixt the eyes, the other becomes sore also, and even ulcers form on the cornea of it. When we know this to be a consequence of the staphyloma, we cannot hesitate about cutting it off.

The intention of the operation is to evacuate the humours of the eye, that the coats may contract, and be within the margin of the eyelids.

## OPERATION.

THE patient is seated as for the extraction of the cataract, and the assistant supports the eyelid in the same manner. The surgeon takes the largest of his knives for the extraction of the cataract, and pushes it through the tumour, in the direction he would cut the cornea in the operation of extraction; but he does not enter the knife so near the margin of the cornea as in that operation. Having made a section of the lower half of the tumour, he takes hold of the flap with the forceps or sharp hook, and completes the circular incision. The tumour being cut off, and the chamber of the aqueous humour largely opened, the humours of the eye are gently squeezed out of the coats, when the eye subsides within the eyelids.

The cornea being the only part cut in this operation, and this being a part neither vascular nor very sensible, the inflammation is some time of commencing. On the fourth day the eyelids are inflamed, and on the seventh or eighth there is pus on the poultices applied to the eye. Scarpa in particular recommends the operation to be performed as I have here described, saying, that very terrible consequences result from including the sclerotic coat in the incision. But I have seen the operation performed by cutting off the whole anterior segment of the eye without any bad consequence; notwithstanding this, the reasoning as well as the facts alleged by Professor Scarpa, must sway us, where there is no advantage resulting from a practice opposed to his.

After the operation a pledget of soft lint soaked in oil, may be applied over the eyelids, and when the inflammation rises, if the fever and pain be great, we must bleed largely, and, as we wish to produce suppuration on the surface of the mem-



branes, we must foment and apply poultices, not repellent cold applications.

#### PROTRUSION OF THE IRIS.

THE protrusion of the iris is marked by these characters. There is a small prominent tumour or speck on the cornea of the colour of the iris. Around its base the cornea is opaque. The pupil is a little removed from the centre, and somewhat changed from its regular form, and the plane of the iris is more oblique than natural; the vessels of the conjunctiva are large and numerous, and the eye is particularly irritable.

This is a kind of hernia of the iris, which is apt to occur after the operation of extracting the cataract, or in consequence of wounds or ulcers of the cornea penetrating to the chamber of the aqueous humour. This is not a relaxation and falling down of the iris, but it is pushed out as an intestine is in hernia, by the contraction of the eyeball, and in the narrow opening of the cornea it is sometimes strangulated too like a hernia. It is impossible to reduce this protrusion when it is the consequence of ulcers of the cornea; for supposing that the iris was separated from the cornea, would not the aqueous humour again be discharged, would not the lens again press forward the iris, so that it would be pushed through the opening of the cornea? The entangling of the iris in the ulcer is not owing to this membrane floating with the current of the aqueous humour, towards the opening; but, as I have described in speaking of the extraction of the cataract, the whole contents of the eye press forward to the breach, and the iris presents first. It has been well observed that this presenting of the iris in the ulcer, saves the eye from total destruction, though it be a painful disease in itself. The practice in this disease is simple. We have to touch it with the lunar caustic; this must be done with the precautions already recommended; the small black tumour formed by the protruded iris must be eat down within the level of the cornea by repeated application of the



caustic. After this we are to endeavour to promote the cicatrixation of the ulcer.

In the same way are treated the small lymphatic tumours, which project from the cornea, after an ulcer or wound. Scarpa proves that this tumour is the protrusion of the vitreous humour and its capsule.

## DROPSY OF THE EYE.

LIKE every other part of the body the vessels of the eye receive a constitutional disposition that keeps the form and proportions of the humours and coats to a limited form. If this natural action of vessels be changed, the effect is some defect of transparency, or some preternatural growth; there is an atrophy or wasting of the eye, or a great increase of the humours, a distension and growth of the coats—a dropsy of the eye.

Dropsy is sometimes a consequence of injury done to the eye, or of high inflammation; sometimes it attacks slowly and without any very evident cause. The symptoms are, a sense of distension with pain in the orbit and difficulty of moving the eyeball. Blindness ensues, and there is no longer contraction of the pupil. In a still greater degree of the disease, the eye projects conically from the eyelids, and they no longer shut upon the eyeball; the exposed surface becomes acrid; there is inflammation and ulceration of the eyelids; the eyeball is inflamed, with great pain and head-ache; the other eye is affected, by sympathy; and an operation becomes absolutely necessary.

THE OPERATION is sufficiently simple. The eyelids are held open; a sharp tenaculum is thrust through the anterior half of the eyeball, and all the projecting part is cut off with two motions of the scalpel. The humours are of course spontaneously evacuated, and the eye shrinks within the eyelids. But Scarpa again frightens us, and recommends instead of this, that the middle of the cornea be cut, as in the Staphyloma.

## OF THE ARTIFICIAL PUPIL.

IN deep inflammation of the eye, following the operation of extraction or depression of the cataract, the pupil contracts and closes altogether; for during the inflammation there being also great irritability of the eye, attended with contraction of the pupil, the iris fixes and adheres, so that there is an entire obstruction to the light. The contraction of the pupil is sometimes more unaccountable, being gradual, and only accompanied with a slight degree of unusual irritability in the eye. The contraction of the pupil is, however, a rare complaint. One should naturally suppose that it would be an easy operation to introduce the couching needle, and cut the iris in the middle part, so as to enlarge the contracted pupil, or form a new one. But it is found, that when the pupil is made in the centre of the iris it quickly closes again. So it happens when the circle of the iris is divided from the circumference through its edge. Scarpa has substituted another operation, of which I should say little, not having performed it on the human eye, were I not certain of its practicability by trial on brutes, and did I not conceive that it is a means of restoring sight in a case not yet thought of.—Scarpa performs the operation in this way:—

The patient is seated as for the operation on the cataract. The surgeon uses a very small, straight couching needle. He perforates the sclerotic coat, as for the depression of the cataract, and about two lines from the margin of the cornea; the point of the needle is carried behind the iris, and before the lens, if it has not been extracted. It is made to advance as far as the upper and internal part of the outer margin of the iris, *viz.* on the side next the nose. The point of the needle is then made to pierce the root of the iris, where it is attached to the ciliary ligament, and when the surgeon sees the point of the needle projecting through the outer margin of the iris, he draws the instrument towards him, so as to separate the iris from the sclerotic coat. Blood is effused during the opera-

tion, so that the aqueous humour becomes turbid, the pain is greater than in the depression of the cataract, and for these reasons the motion of the needle should be decided and quick.

Some time ago, before I had occasion to consider this subject of the contraction of the natural pupil, a patient applied to me who had an opacity of the cornea, covering the natural pupil. As the gentleman possessed the sight of the other eye, I did not advise an operation, which yet I thought practicable, if he had been blind altogether. I thought of opening the iris opposite to the transparent part of the cornea.

FIG. 1.

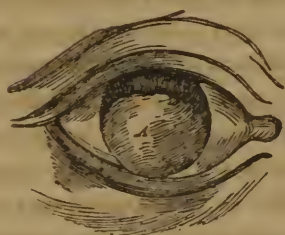
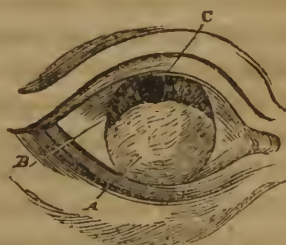


FIG. 2.



These sketches of the eye will illustrate what I conceived it possible to do. In figure 1. the opaque cornea at A, covers the pupil, the relative place of which is marked by a circular line of dots. In figure 2. I have represented a pupil formed by cutting the iris opposite the transparent part of the cornea. A, the opacity of the cornea covering the natural pupil. B, part of the iris seen. C, the artificial pupil\*.

\* I have at present a gentleman under my care for stricture in the urethra, who has submitted to the operation of extraction of the cataract on one eye. The operation has been very successful, but on the other eye the operator has been obliged to bring the point of the knife out at a wrong place, and now the scar of the incision begins at the margin of the cornea and turns in with a spiral line so as to cover the pupil. With this eye the gentleman cannot see but very obliquely, and imperfectly, although the pupil is quite clear of cataract. In such a case as this, supposing that vision was not perfect in the other eye, the sight might be restored, by making an artificial pupil in the iris opposite to the transparent part of the cornea.

It was with great satisfaction I read Scarpa, on the subject of the artificial pupil. The cause for which he performs that operation is rare, but if it shall prove effectual for those opacities which are opposite the natural pupil, how much more extensive must the benefit prove.

#### EXTIRPATION OF THE EYE.

THE patient is placed on a chair, with his head resting on the assistant's breast. The assistant should hold in his hand a blunt hook with which he is to raise the eyelid. The surgeon is seated before the patient. He now pierces the anterior segment of the eye with his tenaculum. The first strokes of the knife are two semicircular incisions, to cut through the tunica conjunctiva, and to separate the eyelid from the eyeball. Then if the eye is very much distended and fills the socket, the next motion of the surgeon's knife ought to be to puncture the eyeball, and allow some of the humours to escape; for, if this is not done, he is cutting in a constrained and narrow way, betwixt the distended eye and the socket, making a tedious operation, and endangering more than necessary, the bones of the socket.

When the conjunctiva is cut, and the knife has gone quite round the eye and the attachments of the two oblique muscles are cut through, the eye would lie loose, only that the optic nerve retains it very strongly. I have seen the surgeon unaccountably forget this, and make repeated and most painful efforts, by cutting and pulling, when it only was required that he should have cut across the optic nerve.

To cut across the optic nerve, the knife ought to be carried flat under the superciliary ridge, and made to glide along the orbital plate. When passed over the eyeball in this direction, a single cut will sever the nerve and muscles which surround it, so as to relieve the diseased parts, and they may be drawn out with only a little adhering cellular membrane.

A good deal of blood should be allowed to flow. If it be required to stop the too profuse bleeding, it may be done by pressing a little dry lint in the inner angle.



## INSTRUMENTS.

A strong flat tenaculum may do to pierce the ball of the eye with; or a large ligature is put through the eye with the common surgeon's needle, or what will be found more useful, and which will much shorten the painful period of preparation, is a hook of the form of the tenaculum, with a shoulder, to prevent its going farther into the globe of the eye than just to permit the point to transfix it. A crooked knife is recommended for this operation, but it will be found a bad exchange for the common scalpel.



The disease sometimes returns. It may be expected if the disease has been really cancerous, and if the parts external to the eyeball have been the seat of the disease. From the confined nature of the part, the whole soft parts within the bone may have been tainted. If so, it will probably happen that when the wound has gone on regularly towards a cure for some time, when you would expect that it was about to close finally, it will stop, and instead of merely filling up, a fungus will rise from the orbit. When this has got to some head, the acute lancinating pain in the head will follow. Or if the wound has healed some months perhaps after the operation, hard tubercles will be felt in the surrounding integuments. Then comes pain striking to the back of the head, with burning pain deep in the orbit, and the brain being at last affected, the patient dies.



## OPERATIONS FOR THE FISTULA LACHRYMALIS.

THE FISTULA LACHRYMALIS is a disease of the lachrymal canal.—In what may be called its complete state, there is an obstruction of the duct which carries the tears into the nose, and a fistulous sore discharging the tears and pus near the inner angle of the eye; the patient only complains of a weakness of sight, the eye is watery, and on every little excitement the tears fall over the cheek, which is sometimes excoriated, the nostril of that side is dry. But this complaint will not admit of a description in the form of a definition; in common discourse we call all the various degrees of the disease of these passages, which might in a latter stage form an open weeping sore, fistula lachrymalis.

1. The first state of disease I shall describe is this: the eye is considerably inflamed and irritable; the edges of the eyelids are tumid, and the glands secrete profusely; the internal membrane of the eyelid is very red, and flakes of mucus are seen upon turning down the eyelid; the integuments over the lachrymal sac are full and puffy, and on pressing these, mucus and pus escape from the puncta. To account for this appearance, there is no occasion to suppose that there is an obstruction in the nasal duct, the disease is general, and all the continuous surface of the eyelids, puncta, sac, and duct, are unusually vascular and spongy.

The natural resource against such symptoms is to endeavour to subdue and counteract this general tendency to a chronic inflammation in the whole mucous membrane and ducts. By astringent injections or collyria, the general relaxation may be removed, and the soreness and swelling of the eyelids relieved by the citrine and tutty ointments; then the sac and ducts must be kept also clear, pressing out the accumulated mucus, and injecting into the ducts until the fluid passes into the nose.

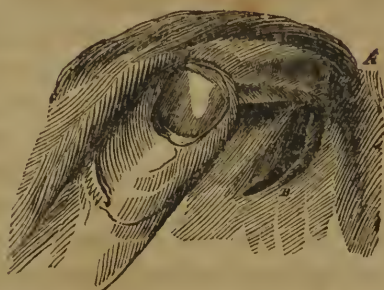
2. When there is not only a watery eye, and tumid eyelid, but a distinct tumour of the lachrymal sac and an exco-

riated cheek, something must be done to make the duct pervious. In this state of the disease, it seems to be ill-judged practice to endeavour to give firmness and resistance to the sac, to make it contract, by cutting open and stuffing it with dressing. This is the same as if a surgeon would continue to scarify and dress a fistulous sore in the perineum, after he knew urine was discharged from it, and that there was an obstruction in the urethra. The only questions to be determined on previous to the operation are these: 1. Is this a disease owing to a general sponginess and thickening of the mucous membrane? 2. Has this general diseased state terminated in a particular stricture, or obliteration of the lachrymal duct? 3. Is there a stricture, or obliteration of the passage which has been the primary cause of the symptoms, and still keeps up the disorder?

But even the answers to these questions are of no great importance, because if an operation is to be done, the entire operation is not more severe, or troublesome, than a more partial attempt to cut into the sac and make it contract and fill up. If it should be found that a more general disease of the membrane prevails, or even if the general affection be proved to be the original cause, this only teaches us to be careful to correct the slight and chronic inflammation of the surface, after the course of the tears is established, and during the progress of the cure.

A great part of this disease consists in the constant excitement which the suppurating sac gives to the eye; and that again is a consequence of the absorption still continuing by the puncta, after the duct is obstructed—for if the sac be closed up and obliterated, and there be no disease originally in the coats of the eye, a great deal of the irritation and even the watering of the eye will subside—and if the puncta be closed, so will the inflammation of the sac subside, because it has no longer the irritation of the acrid tears. Accordingly it is one kind of operation, attended with much relief of symptoms, to obliterate and fill up the sac altogether.

The intention of the following operation, however, is to restore the course of the tears into the nose, and entirely to cure the disease.



OPERATION.

THE patient is placed before the surgeon, and they are both seated. The patient's head is supported on the breast of an assistant, who stands behind him. The surgeon applies his thumb, (in this manner) to the eyelids, and stretches them from the inner angle, so that the small tendon of the orbicularis muscle A, is made particularly distinct. Beginning his incision by piercing the skin just below this tendon, he carries his small knife in a semicircular direction, B, (*viz.* following the curve of the edge of the orbit); raising the point of the knife again, he thrusts it deeper into the upper part of the incision, and penetrates the sac, and slits it downwards.

Or again, if the opening be free enough, it is better to introduce into it a small probe, and following the probe with a sharp-pointed bistoury, to cut open the sac. The next part of the operation is to pierce the bone with the stilette.

In piercing the bone, we have, in the first place, to take care that the point of the instrument be lodged within the natural sac before the perforation is made; for if it is not, as I have known it happen, the latter treatment will only serve to obliterate the sac, and I believe to close the tubes leading from the puncta. Now, if the young surgeon does

not perfectly recollect the relation of the *os unguis* to the nasal process of the upper jaw-bone, and if he points the instrument directly into the nose, he may chance to hit upon the very strong process of the maxillary bone. But if after being fairly in the natural sac, and of course with the point beyond the sharp ridge of the maxillary bone, which forms the margin of the orbit towards the nose, he carries on his point obliquely downward and inward, he comes to be opposed only by the thin plate of bone, (as delicate as a piece of paper), which is called the *os unguis*, and now he will find this part of the operation very simple indeed. By keeping the side of the instrument pressed upon the nasal process of the maxillary bone, and carrying the point forward it will pierce this thin lamina of bone the *os unguis*, and then the point should be more turned towards the cavity of the nose, so as to enter it just before the lateral cells of the ethmoid bone and above the lower spongy bone. That we are right in the direction of the instrument, is known from the very slight resistance which we meet with, and the flowing of a few drops of blood from the nostril, or which may fall into the throat, according as the head is thrown backward or forward.

The instrument being withdrawn, a piece of leaden wire is introduced. This, being worn for a week or a fortnight, is taken out and replaced by a piece of bougie. In the course of two months, when the passage is become like a natural canal, the bougie is withdrawn and the wound allowed to heal; and the tears which have been all this time absorbed by the puncta and carried into the sac, and have passed by the side of the bougie into the nose, continue, upon its being withdrawn, to run by this new passage into the nose. The perfection of the cure is ascertained by the eye having no more than its natural moisture, and that side of the nose which was before dry having now as moist a discharge as that of the other side.

The following is the method of Mr. Ware:—Having opened the sac, or supposing that it has been opened by ulcera-



tion, he introduces the blunt end of a probe, (of a size rather smaller than the common dressing probe), and pushes it on gently and steadily in the course of the natural duct. He overcomes the obstruction by force, and he passes the instrument into the nose by the nasal duct\*.

The probe being withdrawn, a small silver style of nearly the same size of the probe, and with a flat head, which is to prevent its sinking altogether into the nose, is now introduced, and the operation is finished. This little style, passed down into the nose, keeps the duct permeable, while its head being covered with black wax, or a bit of court plaster stuck upon it, has every appearance of a common patch.

This operation is ingenious, whilst its simplicity ensures success. It is not followed by the high inflammation and quantity of matter which will sometimes follow the use of the bougie, and does not therefore endanger the closing of the upper part of the sac or puncta, while from the beginning there is neither confinement nor unseemly dressing required.

Few people, however, will submit to a palliative remedy, such as this operation is, when it is intended that the style shall remain in the nose, and if the operation be performed with the intention of removing the style, and closing the sac, I would recommend that it should be performed as first described, *viz.* by piercing the os unguis, and then substituting the style for the bougie, with the expectation that the patient will submit longer to its use. By this means while the patient enjoys comfort during the cure, he has the better chance of its being perfect in the end.

When we perform the operation by wearing the leaden wire and bougie, or perform it in Mr. Ware's method, we must withdraw the bougie or style, and wash the passage by means of the small syringe; at first every day, afterwards only occasionally, as it may seem to be required.

\* The full descent of the point of the probe into the nose will sink the instrument fully an inch and a quarter.



This prevents the lodgment of matter, and the formation of abscesses.

From what has been said, it will readily be understood that during the cure we must carefully attend to the state of the conjunctiva, and the general secretion of the eye.

As we have already hinted, there was formerly a method practised, the object of which was to fill up the abscess with granulations, and entirely to obliterate the sac, treating the disease like a common abscess. This, on first thoughts, would appear to be a method of increasing the evil, but a great part of this complaint of fistula lachrymalis arises from the excited state of the lachrymal sac and ducts, which produces, by sympathy, an irritation of the eye and of the lachrymal gland.

There may occur ulceration and much internal disease in the part, which may make us still prefer this method to the long continued use of the bougie or the introduction of a style.

Where the ducts are merely obstructed, there is only an occasional flow of the tears over the cheek, when the eye is accidentally excited. The patient complains little of the disease until the sac inflames; and I know there are cases of the common operation producing abscess, followed by total obstruction, without the patient having an idea of any failure in the operation he has suffered.

Scarpa has thought it necessary to recommend in a particular manner, that the sac should be dressed with escharotics to the bottom. I have always seen that the presence of the bougie in the passage was sufficient to inflame and cause the due contraction of the sac. He has thought it necessary too to recommend the use of the actual cautery, to destroy the os unguis, when a new passage is to be formed; a thing which I think I can say with confidence, is never necessary, and must be kept altogether out of the enumeration of our resources.

## CHAPTER II.

## OF THE EAR.

MATTER which flows from the ear may be a mere change of secretion in the glandulæ ceruminosæ. In this case we may inject any mild astringent, as lime water, for cleanliness, and anoint the passage with the diluted citrine ointment.

Sometimes the passage ulcerates, and there is a great purulent discharge from the ear, or after some occasional increase of the inflammation, an abscess or sinus forms behind the tube of the ear. The following consequences may ensue from this suppuration. 1. The thickening of the membrane of the tympanum. 2. The growth of fungous excrescences from the passage. 3. The destruction of the membrane of the tympanum by the progressive ulceration. 4. The communication of the inflammation and suppuration to the cavity of the tympanum.

We must then in suppuration keep a free outlet to the matter, by preventing the swelling of the tube from closing the passage, and by opening the abscess if formed by the side of the tube; we must prevent the lodgment of the matter by every possible attention. Our injection should be some mild fluid at first, and afterwards we may endeavour to correct the diseased surfaces: for this purpose a common injection is the muriate of mercury with lime water.

If the hearing be dull to all outward sounds, but increased to all vibrations of the head or jaws, and there is a confused and loud noise often heard, there is probably only an adherence of tough mucus, about the opening of the Eustachian

tube into the throat, or perhaps an inspissation of the ear-wax, which both prevents the sound from entering the tube freely, and by pressing on the membrane of the tympanum prevents the free motion of the membrane. In this deafness from the inspissated wax, we need only wash out the tube with a syringe and tepid water.

When the Eustachian tube has been obstructed by a disease in the throat, deafness is the consequence. It is in this case that it is proposed to puncture the membrane of the tympanum, that like the hole in the side of a drum it may give freedom to the contained air, and free play to the membrane of the drum; the perforation becomes a substitute for the Eustachian tube.

The patient is placed with the ear towards the direct light of the sun; the surgeon is behind him, and he turns the head until the light is admitted into the bottom of the tube. The point of the silver probe, (a small stilette is used by Mr. Cooper), is pushed through the lower and fore part of the membrane of the tympanum. As it is found that the perforation in this membrane very soon heals, it has been thought necessary to lacerate it pretty freely, but the greater the injury the greater is the probability of the membrane inflaming, becoming thick, and of consequence, incapable of delicate vibrations. I should imagine that it were better for a time to allow a small probe of silver to remain in the passage of the ear, supporting it by a little cotton in the passage. It is an operation of great uncertainty, and leaves the patient to regret the very short enjoyment of the benefit he has been led to expect from it.

But I deem it to be of more consequence to speak here of the dangers of deep suppurations in the cavities of the ear.

Suppuration may take place in the cavities of the ears, and in the mastoid cells, either from the communication of inflammation from the outward tube, from the throat, by the Eustachian tube, or it may be a scrophulous disease, originating in the bone itself. Any one who thinks of the principle of Pathology, which guides us in our surgery of the head, must

at once foresee danger from suppuration and caries of the temporal bone, for though it contain the organ of hearing, yet it takes more importance, in this instance, as a bone of the cranium.

The worst character of the disease is when, after the patient has had violent pains, he is attacked with shivering and fever, and the organ is destroyed, and the passages of the ear are full of pus, and the bones of the tympanum have come away. This discharge may continue long, without any further apparent bad consequences than the loss of the organ, but if there comes drowsiness, and oppression, and a feebleness or degree of paralysis in the opposite side of the body, then the petrous portion of the bone is carious, the dura mater attached to it has partaken of the disease, and the side of the cerebellum and base of the cerebrum are diseased and covered with purulent matter.

The abscess sometimes forms in the mastoid cells, and making a slow progress, such as characterises the scrophulous action, after a time the tumefaction of the integuments over the mastoid angle of the bone betrays its presence. The bone in some instances becomes carious, and the finger can depress the integuments into the bone, and, when this is opened, it is not merely a disease of the bone which we discover, but the surface of the brain is exposed, and the probe can be introduced deeper than the thickness of the temporal bone ; a circumstance which shews the danger of the experiment. Thrice I have seen such suppuration fatal by the communication of disease to the brain, before the spoiled bone gave way outwardly ; and I have ascertained the nature of the disease by dissection.

We learn from this view of the subject, how carefully we ought to attend to symptoms when there is disease in the ear, lest it should become irrecoverably bad, and end in communicating the disease to the brain. We must bleed, and purge, and foment, to allay the pain and inflammation, if it be active. Blisters are to be applied behind the ear, if a slow continued action is proceeding within ; and where we can ascertain that



there is caries in the posterior angle of the bone, with danger of the confinement urging the progress of the diseased action to the brain, we have to apply the trephine and penetrate into the cells of the bone ; even when this is done, if the petrous portion of the bone be carious, there remains only a hope, that by great care, soothing the action, and guarding against the matter collecting, we may gain time, so that the diseased bone may separate, and an abscess in the brain be prevented from forming.



## CHAPTER III.

## OF THE PSOAS ABSCESS

IN the treatment of sinuses and abscesses, the most essential point to be known is, what has produced the collection of matter, and whether the cause be removed—for if we are to cut up fistulæ during their tendency to form, we shall find that only deeper and larger passages open themselves. If we are to open an abscess, we ought first to consider by what means we are to produce a change in the action of the part. The matter of an abscess is not collected, but, like the fluids of the cavities of the body, it is suffering a change; the absorption of the pus is performed at the same time that pus is thrown out by the vessels; and the increase or diminution of the matter of the abscess depends on the relative action of the arteries or absorbents. We have to observe what further change, besides evacuation of the matter, is accomplished by opening an abscess.

Experience teaches us that a scrophulous abscess will seem to point, being soft and prominent, and having fluid evidently in it; and yet that when the lancet is thrust into this tumour, only a pale watery fluid escapes, and the walls of the tumour acquire an inelastic, but irregular, firmness, like a cake: and the progress of the action, or at least the softening of the tumour towards the surface is not promoted but checked. The scrophulous action is here, I suppose, of a slow and sluggish nature, and the phlegmonous action, the consequence of the wound, has somewhat of a contrary tendency, so that the original progress of the disease is not promoted.

Again, in the scrophulous action about joints which has produced abscess, by cutting into this abscess the slow nature of the disease is changed; the matter, though evacuated, collects again, no longer bland or mild, but putrid and acrid, and an irrecoverable caries may be the consequence\*.

It is of little importance whether the change in this particular instance is to be attributed to the air getting access to the secreted matter, and producing an alteration upon it, making it acrid and stimulating; or whether the incision changes the nature of the action in the surface of the cavity, so as to produce bad and foetid matter. But it is particularly of consequence to observe this contrast, that by stimulating the surface and making counter irritation on such a scrophulous joint, the original action might have been changed, and the limb and patient saved; while under this surgical treatment the disease has rapidly advanced.

Where an abscess or extensive fistula forms, in consequence of a wound, it may be permitted to rouse the activity of the surface by an injection or seton, for perhaps there is nothing peculiar in the action; there is only a weakness and inactivity; and by habit the secretion continues.—But even here it will in general be better to raise the life and activity of the whole limb, by admitting freer motion, by warm stimulant fomentation and rubefacients.—For though these communications and abscesses have formed after an injury, it by no means follows that they are merely the consequence of that injury; they have often a scrophulous action; and the injections or seton raise a violent inflammation, and general tension of the limb, which instead of promoting the adhesion of the cavities form others in succession.

All abscesses or fistulæ connected with ducts or natural passages form a class by themselves, which ought not to en-

\* Experience teaches us that it is useless to open scrophulous and venereal abscesses; but further, we find the practice bad as complicating the case, and dangerous as sometimes productive of the phagedænic ulcer. Read the section on abscess in Ford's Observations on the hip disease, which is very valuable

ter into the present inquiry. Such are fistula in ano, fistula lachrymalis, fistula in perineo. In these the difficulty of discharging the natural fluids, produces an inflammation in the ducts ; abscess forms by the side of the passages ; and a communication is made betwixt the duct and abscess by ulceration, and an irritation is kept up ; until the passage be freed the abscess will not heal.

Where an abscess is very large, there is one circumstance requiring particular attention ; it is this, if the abscess burst, that is, if the ulceration proceeds outwardly to the skin, the whole surface of the abscess will inflame, the discharge will become bad, and the patient will die. We open such abscesses, not with the intention merely of evacuating the matter, nor for the purpose of procuring an adhesion and obliteration of its sides, but to allow the cavity gradually to contract so that when it fills again it may not be so extensive nor apt to disorder the system when it is finally opened.

For example, if a large abscess be pointing, and about to ulcerate and burst, it is to be punctured, and the matter evacuated ; but it is not to be lanced just upon the most prominent, and thinnest part. The opening should be made by the side of that part of the abscess where it naturally may be expected to open. The opening is thus to be made in the healthy skin, so that the wound may close again without any ulcerative action taking place, and without the risk of inflammation being propagated over the sides of the cavity. From the evacuation of the matter, and contraction of the cavity, the walls of it thicken. When the cavity fills again, it is less extensive ; it is to be punctured again, and the opening immediately closed ; the abscess still further contracts, and perhaps by the third or fourth opening the abscess is so much diminished that no care need be taken to close the opening ; it may be left to common treatment.

These introductory observations will be found necessary to the understanding of the short statement I am now to give of the nature of the lumbar abscess, and the treatment of it.

## PSOAS, OR LUMBAR ABSCESS, CONTINUED.

THE Psoas Abscess is the consequence of a slow and almost imperceptible inflammation of the cellular membrane, by the side of the lumbar vertebræ, and around the psoas muscle\*. These deep parts, from their nature as well as their situation, being little sensible, and the disease being a slow, scrophulous action, the nature of the complaint is only suspected when there is a weakness in the loins, a numbness and weakness of one thigh, and a dull wearying pain in the loins like rheumatism; nor is there at first general symptoms to mark the diagnosis more distinctly. Sometimes the pain in the loins is very severe, with a total inability of raising the thigh. But when a compressible tumour appears in the groin, the fluctuation is perceptible in the tumour, and pulsation is felt in it when the patient coughs; then the nature of the case is too evident, and the surgeon has that painful conviction of a patient being in the utmost degree of danger, while he is little conscious of it himself, and but imperfectly comprehends how a matter so trifling in appearance, and so little troublesome, is pregnant with so great evil.

If there precedes or accompanies the appearance of abscess at the groin, a curvature of the spine, the prognosis is still more unfavourable, for caries of the bodies of the vertebræ is sometimes the origin, or at least, the precursor of the psoas abscess. As might be naturally expected, especially when the disease is complicated with a caries and sinking of the spine, the abscess sometimes makes its way outward upon the loins, forming a tumour by the side of the spine.

If the tumour in the groin is opened, and the matter of the abscess evacuated, the sac inflames, the loins become weak and painful—rigors, a rapid pulse, white tongue, and

\* The abscess is sometimes in the centre of the psoas magnus. This disposition to form abscess in the centre of the larger muscles, I have seen very generally prevailing; on dissection, I have found them in the psoas, the gastrocnemii, and in the muscles of the thigh.



hot skin succeed—the discharge becomes thin and foetid, and often profuse, the appetite entirely fails, the nights are restless, and a rapid hectic is confirmed.

The cure is to be thus conducted:—1. To evacuate the matter and yet endeavour to prevent the inflammation of the sides of the abscess. 2. To produce a counter irritation by an artificial ulcer on the loins. 3. To correct or change the action, or produce an absorption of the remaining matter by emetics or by electricity.

If the abscess has formed a tumour in the groin, and the fascia be yet entire, and the integuments on the prominent part of the tumour thick and not yet possessed of much increased vascularity, the abscess lancet is to be thrust into the most prominent part, a little slantingly through the skin; but if the tumour be threatening to burst, we should puncture it not on the highest part, but more towards the base of the tumour, so that the opening be made in sound skin, which will more readily close and heal.

When the pus and coagulable matter are evacuated, the wound must be treated tenderly, united by a small piece of plaister, and bound down with a soft compress and bandage. We must be careful that nothing intervenes betwixt the lips of the wound, that the union of the skin may be secured; and by the compress the integuments are pressed upon the fascia of the thigh, so that the opening through it is closed also, and the matter of the abscess prevented from passing under the skin. The patient for a time must be confined to the horizontal posture, and use no exertion in raising himself, or in moving the abdominal muscles.

When the small wound is healed, then more freedom is allowed to him, and gradually the tumour appears again. When it has acquired a size and prominence sufficient, it is to be punctured a second time and healed; and this successively until the matter evacuated be no longer considerable. When only a few ounces are evacuated, and the state of the patient is favourable, Mr. Abernethy leaves the puncture open, being no longer solicitous to prevent the inflammation of the



sac; or rather it is better to endeavour to cause an absorption of the remaining matter of the sac, by giving emetics and sending the electric spark through the loins and side. If there should occur much debility during the cure, bark and wine and free air will do much; and opium with the bark will be required if there be much irritation in the sac or diarrhœa.

Another resource for correcting the internal disease in the loins is the formation of issues by the side of the vertebræ, as for the disease of the spine; and this treatment is particularly necessary when there is a tenderness on pressing the spines of the vertebræ, or a degree of curvature of the spine accompanying the abscess.

It is to Mr. Abernethy that we are indebted for this plan of treatment of the lumbar abscess, which affords us hopes of curing a disease before considered fatal.

## CHAPTER IV.

## OF THE DISEASE AND INJURY OF THE SPINE.

---

---

OF THE CURVED SPINE.

THIS term does not include the distortions of the spine, from rickets or mollities ossium, but that only which is the consequence of an ulceration and wasting of the bodies of the vertebræ, a disease most frequent in the lower vertebræ of the back.

In an infant these are the symptoms: the mother tells you that the child was strong and healthy, and perhaps that he had begun to use his feet, and could stand upright with little assistance, but that of late he does not try to stand, and when laid over her knee, he does not struggle as children naturally do with their feet. You find the child's flesh soft; and particularly the skin and muscles of the lower extremities, soft and woolly; upon examining his back, you find one or two of the spinous processes of the vertebræ particularly prominent.

If the child be old enough to have walked, he is gradually deprived of the use of his legs; he complains of languor and fatigue; he is listless and unwilling to move; his legs are apt to cross, and he stumbles often, being unable accurately to direct the foot. He leans forward, and there is a projection in the spine. Large abscesses sometimes form and drop down upon the loins, and appear externally in the top of the thigh, or a tumour is formed by the side of the vertebræ of the loins.

In the latter stage of the disease there is pain of the back or loins, which even in bed is tormenting and incessant ; the breathing, and indeed the whole functions of the thoracic and abdominal viscera, are oppressed by the chest falling down in consequence of the great curvature of the spine. The urine and fæces are passed insensibly, and in consequence of this perhaps as much as by sitting on the insensible buttocks, (the perpetual pressure on which gives no token of the degree of injury they sustain), deep sloughing or horrible ulcers take place.

This is a scrophulous disease, which begins in the bodies of the vertebræ of the back or loins. By dissection I find that the first stage of the disease is not an increase of vascularity and softening of the bodies of the vertebræ, so that they sink under the weight of the body ; but the progress of the destruction of bone proceeds by the entire absorption of several intermediate portions of the body of the vertebræ, leaving the spine supported by the remaining firm parts, which are sometimes like columns standing betwixt that which is decayed. (I have given a plate of this early appearance of the disease).

The destruction of the bone having gone thus far, the affected bodies of the vertebræ sink under the incumbent weight of the head, chest, and arms. The paralysis of the lower extremities is now for the most part distinctly marked, but as I have seen this symptom before the sinking of the vertebræ, I have concluded that the neighbourhood of the diseased bone has involved the spinal marrow in the morbid action, so that its function has suffered.—The cessation of the disease relieves the paralysis ; which is accounted for by supposing that the spinal marrow and the tube of the vertebræ become adapted to each other ; but the circumstance is equally well explained by supposing this to be the result of the cessation of the diseased action.

In a young person who has shot up to great height, and whose muscular strength is not great, there is a possibility that a curve of the spine may arise from a bad habit merely, but these curvatures are generally lateral. In the true dis-

ease, the pain or uneasiness deep in the spine, with that countenance and habit peculiar to scrophula, will urge us to examine the spine, and if we should not find that there is a beginning prominence in the spinous process of one or two of the vertebræ, yet by pressing with the fingers along the spine, some one of the spinous processes will be found to give pain perhaps, and in this case we should not delay the remedy\*.

The grand remedy for this disease is the making of issues or setons by the side of the affected spine. But I cannot think that the good effect of these artificial ulcers is from their acting as drains. I see them lose their effect when they become stationary ; I see, even in the first violence of the irritation and inflammation, a remarkable change on the disease for the better, which does not continue if the surrounding skin and deeper part lose their inflammatory action. Once I found quick and remarkable relief given by the caustic eating much deeper and broader than I intended or thought right ; and I have on another occasion witnessed the remarkably good effects of the hospital sore catching the issue, and destroying the soft parts to a great extent.—In this last instance the healthy inflammation which succeeded the sloughing of the sore made an immediate change on the disease, and the patient got quite well. In short, I conceive that the inflammation excited in the neighbourhood of the disease, (which is of the nature of a slow and sluggish scrophulous inflammation), invigorates these affected parts, and reaching even to the vessels of the bone changes the nature of their action, and restores the natural influence.

In this view I prefer the making of issues with the caustic of a longitudinal form by the side of the curve of the spine, first one, and when the surrounding inflammation is contracting, and the ulcer likely to become stationary, I make another in the other side of spine, for a time neglecting the first ; and afterwards I conceive it necessary to keep up a considerable degree of irritation in the one or other of the issues. I

\* See Sir James Earle, On the Curved Spine.



believe pain, or in other words irritation, to be absolutely necessary to the effect, and I cannot prefer the seton to the caustic because it gives less pain.

If the child be young, it will only be necessary to take care that he be not carried in the usual way in the nurse's arms, but lie horizontally. If the child be more advanced, it is of the first importance that the spine be supported, and the weight of the upper part of the body taken from the diseased vertebræ. For this purpose, Le Vacher's apparatus is the best. But I may remark upon this subject, that our object should be to support, not to stretch the spine.

If we find that by an apparatus we can elevate the vertebræ which have sunk, yet this should not be done, for the final cure is to be obtained by the ankylosis of the vertebræ; if they have been once destroyed, and have sunk, to separate them is to prevent the natural process of cure.

Here, as in most cases, pain is the indication of mischief, while relief from it gives hopes of an amendment; now when we see a poor creature moving with much distress, seizing on every object for assistance, and leaning with his hands on his thighs to give relief to the pain of the spine, how can we doubt but that to take off the pressure of the head and chest will promote the cure.

The success of our endeavours to cure this disease in the spine, is to be judged of by the allaying of the complaint of pain, or of fatigue of the loins; by the sleep and appetite being good; by the ceasing of involuntary spasms of the limbs, the flesh of the thighs and legs being firmer to the feeling; lastly by the diminution of the curvature of the spine, and by the patient perceptibly growing taller.

I am naturally called upon here to say a few words on rest, and its absolute necessity in this, and in many other diseases of the bones and joints. Those who are bedridden are generally suffering from disease, and the weakness induced by the disease is attributed to the confinement: but the contrary holds good when the disease is of a nature to be relieved by



rest ; for then lying in bed restores the patient : under the confinement he gets fat instead of wasting. Lying in bed is too often a confinement to bad air, the breath and exhalations are confined, and a free circulation of air is not admitted. But if, on the contrary, the person confined to bed be cheerful and not despondent, and if he be as careful to change his apparel and bed-clothes, and to wash, as if seeing company, and to eat and drink in the moderation proportioned to the little exhaustion or exercise which his situation allows of, he will get fat and enjoy health.

In very bad cases of distorted spine, therefore, I conceive that it will be better to keep the patient in bed or on a sofa, until there be a favourable change in the disease, and that when the ankylosis has formed, or the diseased vertebræ consolidated, the patient may have the relief of moving about under the apparatus for supporting the spine, until the cure is established.

That part of Pathology which explains the diseases of the spine, and the effects of injuries of the vertebræ, is very important. We find the spine to be a column composed of many bones jointed and united by ligaments. We find that while the column has to support the weight of the head and trunk, it is at the same time capable of a certain slight degree of motion betwixt its individual bones. Above all we can never forget that is a tube protecting a prolongation of the brain, the spinal marrow. We find that besides the tube of bone, the spinal marrow is surrounded with a sheath, as a further protection.

Considering these circumstances, we see a strict analogy betwixt the effects of disease and injury of the vertebræ, and of the skull ; in both instances the high importance of the subject results from the nature of the contained parts. The brain suffers concussion in every shock given to the head ; compression and injury from fracture of the skull ; inflammation and suppuration from disease or death of the bone or of surrounding membranes. So does the spinal mar

now suffer from a blow on the spine: so is it bruised or compressed when there is fracture of the tube of the vertebræ: so is it inflamed or compressed when there is caries of the bone or disease of the membrane; while it is exposed to further injury by dislocation of the vertebræ.

## OF FRACTURE OF THE SPINE.



I HAVE had an opportunity of examining by dissection only one instance of FRACTURE of the BODY OF THE VERTEBRA. The bodies of the vertebræ are not fractured by blows, but by falls, in which the whole body is twisted, or when a bank of earth falls upon and buries a man. This fracture will not be known by the crepitation like a common fracture of the limbs, but only by the derangement of the projecting spinous processes; while yet they are not separated as in dislocation, nor crushed and crepitating as when they are themselves fractured, or a blow upon them has crushed in the arch of bone.

I have given above, a sketch of the parts in the instance I examined, and it is seen how the body of the vertebra at A is broken, while the intermediate tough and ligamentous substance B is entire; it will be seen too how the point of the bone C is forced against the spinal marrow D. The crush-

ing of the bones hurts the soft substance of the spinal marrow, although it appeared entire, being covered with its tougher sheath.

I believe that the force which fractures the bone will at the same time destroy the spinal marrow, and the effect will be paralysis of the lower extremity, and in the end death.

The substance or bodies of the vertebræ may be said to be fractured when a bullet lodges there. Gun-shot fracture is a desperate and generally fatal case; for if the ball has entered from before, it must have passed through the viscera of the thorax or abdomen, and if from behind it must have injured the spinal marrow. If it has entered by the side into the bodies of the lumbar vertebræ, it may lodge there without being fatal, and may drop from its place after inflammation and suppuration have reduced the patient; but the chance is, that by the concussion of the spinal marrow or breaking up the tube of the spine into splinters, the injury will prove quickly fatal.

If the spinal marrow be cut through by a bullet, a man may live a longer or shorter time, according as the division has been made in the loins or higher, as in the neck. If the division has happened in the loins, there may be only paralysis of the lower extremities, and insensibility of the bladder and rectum. If higher up, the bowels will suffer more by distension. If the division has been made high in the neck, the patient will die suddenly from the supply of nerves to the muscles of respiration being cut off.

Besides fracture of the bodies of the vertebræ, and fracture by gun-shot, there may be fracture of the arch of the vertebra, which forms the tube for the spinal marrow. A man falling backward and having his spine curved and projecting, may, by hitting a stone, fracture and beat in the arch of bone; or, supposing that he is driving a carriage under a gateway, stooping, thinking to avoid the arch, but does not, he strikes the same part of the chain of spinous processes against the arch, then the blow breaks the tube of the vertebræ and forces in the tube and spinous process, so



that he becomes paralytic in all the lower part of the body.

In whatever way the vertebræ are broken, the danger of moving the body must be apparent, since in every change of posture, or turn of the body, the broken bones may be thrust against the spinal marrow. Looking to the anatomy as our only guide, we see no reason why in fracture and depression of the tube of the spine, the surgeon should not make an incision, and draw out the fractured portions, and elevate the arch! But when we turn our attention to the real circumstances of the case as it has actually presented itself in practice, we find the bones have been crushed, the swelling general, and the paralysis complete. If this paralysis proved that a piece of bone stuck in the spinal marrow, then we might proceed to operation. But as a blow less than sufficient to crush the spine will by concussion produce the paralysis, we are tempted to wait and hope. But if the bones are evidently crushed in upon the spinal marrow, then raising the bone will not remove the injury to its substance. In short, the uncertainty of the circumstances of the case, joined to the little probability that the operation would do good, supposing that the bone has been crushed upon the spinal marrow, or has entered its substance, deters us from laying open the canal, the more especially as we have the chance of doing more mischief than good.

When called to a patient in this situation the surgeon carries a catheter with him to draw off the urine, because he knows that the sensibility of the bladder is destroyed, and that there will be in a short time, an accumulation of urine. There will come flatulent distension of the abdomen too, and vomiting or hiccup, for which (in this case) terrible symptoms we have only to palliate by ordering very stimulating clysters, and frequent friction of the belly. If the patient survives the first shock, the insensibility of the hips and lower extremities will allow him to lie pressing the hips and nates till they mortify. This mortification and ulceration on the sacrum may be accelerated by the insensible discharge



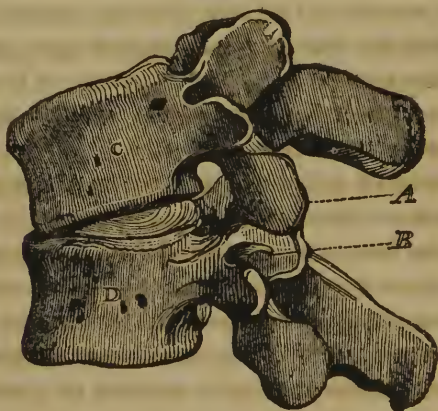
of fæces or the dropping of the urine, and consequent moisture of the bed. After this the patient soon sinks.

#### OF THE DISLOCATION OF THE VERTEBRÆ.

DISLOCATION cannot take place in the vertebræ of the back and loins, I imagine; from the circumstance of the ligamentous connexions being fully stronger than the bone. But a species of subluxation may certainly take place in the lumbar vertebræ. This is a dislocation of the articulating processes, but not of the bodies of the vertebræ, the intervertebral substance being only a little irregularly stretched.

This derangement of the bones may be a consequence of the distortion of the body in wrestling or tumbling, or by a weight falling on the shoulders, when the body is bent forward. By this means the ligaments already stretched are torn up, and the vertebræ stand thus:—

*Plan of dislocated Vertebræ.*



A, the articulating process of the upper vertebra. B, the articulating process of the lower one. These, it will be observed, should lie flat on each other, instead of which their points stand opposed, so that the bodies of the verte-

bræ C D cannot come into their regular approximation, but stand with oblique surfaces.

From what is here expressed the symptoms which characterise the accident may be learned. The person is bent down, and unable to elevate himself; there is a projection of the spine, and there is an unusual space betwixt two of the spinous processes.

The reduction of this dislocation is by no means easy to accomplish. We cannot turn and twist, nor yet stretch the body, as we would an arm or leg. Was our strength equal to it, there is danger, where we have the soft spinal marrow within, and where the strong connexions of the processes are already lacerated. The older surgeons have recommended that the patients should be put over a barrel, and that the body be then bent forward until the processes of the vertebræ are disentangled. It has happened that after all methods have been tried in vain, the patient has been relieved by an accidental jolt or exertion, and the bones have slipped into their places.

When the reduction has not been accomplished by the efforts of the surgeon, yet in length of time and by degrees, the spinous processes have approached, and the patient has regained the erect posture.

Dislocation, I imagine, cannot happen in the vertebræ of the back, because of the firmer articulation of the processes, and the strength of their attachment by the double articulation of the ribs. But we may have sublucation in the vertebræ of the neck. A man, having slid off a hay-stack, fell on some loose hay that covered the ground; the skull was not injured, but he never recovered the shock, and died of the concussion. In this man I found that I could introduce my fingers betwixt the third and fourth vertebræ of the neck; and on opening the tube of the vertebræ a great quantity of fluid blood flowed from the spine and base of the skull. These, I believe, will generally be the circumstances attending the sublucation of the vertebræ of the neck, *viz.* that the shock of the head and spine will destroy the

patient and that the symptoms of concussion will be aggravated by the blood effused from the ruptured vertebral veins.

But another effect may be the result of a lesser degree of injury to the ligaments of the spine, when the neck is thus twisted under the pressure and falling of the body. The whole soft parts around the bone, and within the canal of the vertebræ, may be so injured that there may arise a thickening of the sheath of the vertebral canal, and consequent pressure of the spinal marrow; or I have thought that the injury to the spinal marrow may produce a slow disease in it, which at last destroys its function, and makes all the body below paralytic. If a train of symptoms, ushering in paralysis, should succeed to a twist of the spine, or to any kind of injury, we shall be led to employ all such means as are proved in caries of the spine to be effectual for removing the deep-seated disease.

## CHAPTER V.

## OF THE DISEASE OF THE HIP JOINT.

**T**HIS is a scrophulous disease.—It is most common in youth, from childhood to the twenty-fifth year; but the same disease attacks those of sixty years of age. The disease begins with a deep-seated pain behind the trochanter major; the pain being aggravated by motion, the patient, in walking, throws the weight of the body on the opposite side, and there is consequently an awkward crippling gait. Exercise, we are told, in the beginning of the disease relieves the pain, but it is aggravated in the stiffness after fatigue.

When the disease is formed, and while yet in its first stage, the limb is lengthened. This is not merely a feeling of greater length in the limb, occasioned by the inflammation and increased sensibility of the parts which form the hip joint, but there is a filling up of the acetabulum, and a protrusion of the head of the thigh bone from its socket.

During this progress of the disease, there is as yet no discolouration of the skin; but the hip is swelled over the joint, and, from want of use, the muscles of the hip are flabby. The trochanter major is prominent, and in consequence the hip is increased in breadth. Dr. Falconer observes, that there is to be felt an enlargement and projection of the tuberosity of the ischium as well as prominence of the thigh bone.

With the want of exercise the leg and thigh waste, and, in the advanced state of the disease, the limb instead of being longer is considerably shorter. The difficulty in the motion of abduction or throwing the leg out sideways is considerably greater than that which is felt in moving the limb in any



other direction. This is owing to the relation of the bones, or entire dislocation of the femur. There is a peculiarity in the seat of the pain, too, which must be held in remembrance, else we shall be employed in fomenting the knee and leg for a disease in the hip. I have found a disease of the nerve in the ham, producing pain in the sole of the foot, continued for nearly two years. So I believe that in this case the ischiadic nerve passing so near the seat of disease, is affected, and pain is the consequence, which is attributed to the outside of the thigh, the knee, and leg. When the pain is deep in the groin and in the inside of the thigh and knee, it is probable that the obturator nerve may be involved in the inflammation.

When suppuration takes place, there are startings and catchings during sleep. The pain is increased, with much tension and throbbing; now the skin inflames, and the abscess bursts either in the groin or behind the trochanter. Successive abscesses will sometimes form around the joint, and still the patient survives. The limb being fixed, the granulations of the inflamed joint run together, they ossify, and an anchylosis is formed.

But often, the abscess advancing, and the skin being inflamed, hectic fever rapidly reduces the patient, there is perspiration, diarrhoea, a white tongue, a face changing from the hectic flush to the leaden coloured paleness of those who are tabid; they linger thus, and die.

This hip disease is an inflammation peculiar to the scrophulous constitution. It attacks the ligaments and cartilage in the parts enjoying a less active and vigorous circulation. There is danger of its being confounded with rheumatism, gout, or the psoas abscess.

As to the CAUSE, it is scrophulous disease. The bones and joints of the lower extremity are most liable to disease, and of these chiefly the larger joints: therefore the knee is most liable to disease; next in frequency is the hip joint; then the ankle joint.

Dissections prove that the cartilage is absorbed, that the bones of the pelvis forming the socket, and the head and neck of the thigh bone are wasted and carious ; or after the inflammation of the bone, and the wasting of the cartilage, the bones unite and form an ankylosis\*.

Ankylosis is not necessarily the cure of the disease, nor a natural termination to it. I believe it takes place thus:—The inflamed bone not being under the influence of that law which contracts and directs the growth of parts in their natural action, irregular processès are formed, which, projecting, hinder the motion of the joint ; by the loss of motion the incessant irritation of inflamed parts, moving on one another, is taken off the joint, the latter being now preserved steady ; the bones unite ; and the surrounding abscesses being no longer festered by the pain and irritation within, they are contracted and dry.

In the cure, I have advised repeated small mercurial purges, with hot fomentation, when the complaint seemed doubtful. If the complaint begin with a violence of the inflammatory symptoms proportioned to the injury to be produced afterwards, both to the joint and the system, bleeding would first of all be thought of. But, when the surgeon is first called, there is a low irritability, with a quick, small pulse, and he is more inclined to apply stimulants to the surface, without further reducing the action of the part by leeches ; or supposing that the disease appears in a state so equivocal that the patient thinks it still rheumatic or gouty, a large stimulating plaster may be applied to the hip and thigh. But if the complaint be distinctly marked, the caustic is to be immediately applied.

\* See what is said on the subject of tumours.

## CHAPTER VI.

## DISEASE OF THE KNEE JOINT.

OPERATIONS are at least proposed to be performed on the knee joint, which make it necessary to take a general review of the diseases of the knee. Why we should take this joint in particular after the hip joint, is sufficiently evident. It is the largest joint ; it carries the whole weight of the body and limbs ; it is weak in the structure of the bones, and consequently complicated in its ligaments. The ligaments and tendons about joints are very subject to disease, and here they are exposed, being only covered by the integuments, whilst in the other larger joints they are protected by large muscles.

IN WHITE SWELLING, an uneasiness and weakness in the joint are first observed ; the pain increasing, it is observed to be fixed ; and now on each side of the tendon of the patella there is a soft, puffy tumefaction. By some supposed strain, or in consequence of damp, or cold, there is an increase of pain and swelling ; in proportion to the increase of pain is the swelling becoming more general. When the pain increases, the constitutional irritation commences, and is marked by an accession of fever in the evening.

The swelling of the knee in this disease has something peculiar in it ; the skin is smooth and clear, the tumour regular and uniform, covering and concealing the natural projections of the heads of the bones.

The disease is yet in the ligaments and cellular membrane around the joint, and perhaps not yet in the cartilages of the joint. But now a very peculiar appearance is produc-

ed. To save the pressure on the joint the patient allows the toes only to touch the ground, the knee is consequently bent, and the inflammation which surrounds the hamstrings produces a permanent stiffness, the leg and thigh waste from inaction, so that altogether the swelling of the knee appears more remarkable than it is in fact.

The disease proceeding in its course, and the hectic fever being established, the strength and spirits fail; the cartilages of the joint are now consuming, and about this time the symptoms are aggravated by external inflammation; the skin sometimes bursts and discharges pus, which has often no connexion with the general swelling, nor does this discharge diminish the swelling, or relieve the pain of the joint in any considerable degree. But matter is now formed around the joint, and the sinuses will sometimes admit the probe to pass in all directions.

When the leg is amputated, this is the appearance which is presented on dissection. The cellular membrane around the joint is loaded with viscid fluid, which, contained in the cellular texture, resembles jelly. The ligaments have lost their natural density and lustre, and fistulous sinuses run betwixt them and the surrounding tendons; within the joint there is lymphatic exudation, in the advanced state of the disease the cartilages are corroded, and lastly, the bone itself suffers by ulceration.

The disease varies much in its period. I have seen it run its course in two months, and I have seen the constitution bearing up against it for years, though the disease was most distinctly marked, and the suffering almost continual.

To say merely this is a scrophulous disease, is saying very little. It is a disease falling peculiarly on parts having little blood circulating in them, and which consequently possess low powers of life. It seems first to attack the ligaments and cellular membrane, and then the cartilages.

Often I have known surgeons in consultation on the propriety of amputating in a white swelling of the joint, give their opinion decidedly for amputation, because the bones,



were enlarged. But on dissection, there proved to be no enlargement. Mr. Russel well remarks in his treatise on this subject, that the bones are seldom diseased when they appear to be so, and that the deception proceeds from the effusion that is around the joint. But the bones are actually enlarged sometimes: yet this is no cause for cutting off the limb. There is no reason for determining on an amputation but the declining of the patient's strength to a dangerous degree. I have looked on the enlargement of the bone with satisfaction, as providing for ankylosis of the joint.

If it be denied altogether that the bones are enlarged, then how does it happen that a patient comes to us saying, "It is very odd that his bad leg is longer than the other, although he keeps it thus bent;" is there any other way of accounting for this than by supposing that the bones are enlarged? The enlargement of the bones favours the cure of the disease in this manner: they do not ulcerate on the surface, but become inflamed and spongy in their whole substance; the articulating surface becomes irregular, and ill adapted for motion; the motion of the joint is lost, the bones unite; and there being no longer irritation from the incessant motion of the joint, the disease fortunately subsides.

In white swelling, the patella is not forced up from its natural contact with the surfaces of the condyles; when pressed it is unyielding, and gives pain. We have to doubt the reality of there being a dropsical swelling of the joint, unless the patella yields on pressure, or the fluctuation can be distinctly felt on one side of the tendon of the patella, when we strike smartly on the other side.

When a patient, perhaps of a weakly constitution and pale countenance, is seized with an attack of pain in the knee, I do not immediately think of applying leeches; but, on the contrary, foment, wrap the limb in flannel, and keep it in perfect rest.

If the pain continues, and is fixed, not diffused over the joint, nor has shifted to any other joint, I dread that we are to have a confirmed white swelling. I take blood by four or

five leeches: but not with the intention of reducing the inflammation by this means, but to prevent a great increase of action on the application of blisters to the sides of the knee joint. Repeated blisters I conceive to be absolutely necessary to remove a deep-seated disease, and I have observed the greatest difference in their effect, according as they have been applied, without previously taking a little blood or not. When there has been a tendency to inflammation, and considerable power in the part, blisters have increased the general action in the joint, but when the activity of the vessels was previously diminished, they seemed to have substituted the superficial inflammation for the deeper disease. A blister should be applied on one side of the joint, the size of the palm, and as the inflammation subsides, a similar one is to be put on the other side, and thus a considerable action is to be kept up on the surrounding surface.

Unless there is strong reason to suppose that there is an active inflammation in the joint, I would not recommend the common cold application of linen wet with the solution of cerussa acetata in vinegar and water. If the swelling and general inflammation of a joint have succeeded to a blow, then I would bleed freely with leeches, and apply the cold wet cloths to it; but if in a constitution not prone to active inflammation, there comes a deep fixed pain, I would rather order occasional warm stimulating fomentations with flannel or sinapisms to be applied to the joint, and the application of a stimulating plaster, as of gum ammoniac, with vinegar of squills, or the cummin seed plaster. To weakly children with diseased joints, there can be no better applications than the latter.

An inflammation of the joints (the knee joint for example) which has no mark of the scrophulous action, nor any thing constitutional in its nature, must be treated with a more rigorous intention of diminishing action. Leeches, and after them cold saturine solutions are applied to the joint, and if the pulse and general fever be rising, blood must be taken freely from the arm, the patient must be purged with the

neutral salts, and after the bleeding and purging, an opiate at night will have the most soothing effect.

When high inflammation attacks the knee in consequence of a blow, and is subdued by evacuations and cold applications, yet it will happen that the relief is only temporary, and the inflammation in all its violence will return. We are kept long in suspense by the great tumefaction, and the deep pain, and are unable to say whether the cavity of the joint have at length partaken of the disease. When the violence of the inflammation cannot be subdued, and the relief is partial, then suppurations form around the joint, which when very distinct, may be opened; but I must here give this caution, that we may not be deceived, and take effusions into the bursæ, or into the cellular membrane, for abscesses.

The inflammation will sometimes be continued and violent, and yet the joint escape from the capsule, checking the progress of the inflammation from the outward parts into the cavity.

When the inflammation has been violent, there will be adhesions betwixt the tendons and their sheaths, and an obliteration of the bursæ. The consequence is a stiff joint. Where the constitution is uncommonly good, we may venture by friction and motion to restore the joint; but where the case has proved obstinate, and the inflammation has continued long, in a more obscure degree, we ought to try no such experiments as extending and moving the leg. Where the limb is longer than the other after any disease of the knee, it would be quite wrong to make the slightest attempt, for this circumstance shews us that the bones of the joint are enlarged.

If the capsule of the joint should be wounded, pierced with a nail, or opened but in the smallest degree, there is great danger to the joint, and even to life. I have seen a man suffering from such an accident, delirious, with his face flushed, the eye brilliant, the limbs swelling in powerful struggles, yet this high inflammation was long in coming, the corner of his adze had been struck into the joint, the wound

appeared trifling, and there was not the slightest pain or discolouration for many days. I have not seen such inflammation of the knee fatal, but I can well believe that it may be.

It is possible to mistake DROPSY OF THE KNEE JOINT for White Swelling, yet I should imagine it was easy to discover when there is fluid collected in the joint in any considerable quantity. In the relaxation and dropsy of the knee joint there is no pain; when we press the patella, the swelling is chiefly on the sides of the ligaments of the patella, it is soft and undulating, and putting the hand on one side of the patella, and tapping the other with the fingers, we are sensible of the fluctuation. It is a disease of weakness. The dropsy that occurs after fever is evidently so, and is removed with the returning strength. Often the swelling comes suddenly, without its being possible to assign a cause, and it has been considered as a consequence of syphilis and scrophula.

The first thing we have to think of, the most effectual, and that too which can do the least harm, is to apply a good elastic flannel roller. I have seen swellings of the knee which were taken for the most confirmed disease disappear in a night. Stimulating frictions are to be employed when they do not interfere with the bandage, and moderate exercise is not only allowable, but necessary to the recovery of the joint, and to give vigour to the circulation.

From the violent inflammation which I have described, as a consequence of wounding the joint, it will be evident that my opinion must be entirely against opening the knee joint when such collections are formed in it.

The BURSE which are around the joints are sometimes distended with fluid, while the joint is not affected. The bursa under the ligament of the patella, or the large bursa under the union of the quadriceps femoris to the patella, are sometimes full of fluid; these I would be averse from opening, because the opening will do no good unless there arise inflammation, and inflammation under the ligaments of the patella would quickly pervade the whole knee joint.



When the large bursa under the deltoid muscle, and the acromion process of the shoulder is enlarged and full of fluid, compression and stimulants failing, it may be opened if it have arisen as a remote consequence of a bruise.

No tumours arising from the deep parts of the hip joint should be opened; even the lesser tumours about the ankle joint and wrist ought not to be touched with the knife or lancet.

The LOOSE CARTILAGES or *moveable bodies* which form within the knee joint are with difficulty to be accounted for. They are, however, a cause of great distress and lameness. A fine young man shall be at cricket, in full career, when these bodies escaping from the corners in which they usually lie, and coming betwixt the heads of the bones, he will be thrown down with a pain in the knee, extremely violent and at the same time sickening and subduing. Assisted by the experience of the patient, we are to endeavour to get the body from betwixt the prominent parts of the bones; if the body remains long in a situation giving pain, the secretion of the joint is increased, and a considerable inflammation will rise. In this state we must allow the loose body to rest where it is, and keep the patient from exercise until it shall, by some accident of position, drop into the place of rest.

When we have got the body extricated from betwixt the bones, we must endeavour to keep it there by binding the joint, and pressing down the patella, that no exudation may be poured out in any quantity, and that the surfaces of the bones may be kept in contact, so that the body cannot insinuate itself betwixt them.

I have said that I am averse from opening the knee joint, and I have never seen a case of loose bodies in the joints, where I could recommend it, or where the pain, lameness, and confinement, attending the presence of the body, were not outweighed by the danger which the operation presented.

If ever the temptation to operate should present itself to me it must be in this form: the patient shall have been long tormented, the occasional lameness and confinement must interfere with his means of living, he must himself prefer the

risk to the incessant pain and helplessness, and the body within the knee must be loose, and distinctly felt prominent.

THE OPERATION may be thus conducted: The body having presented in the side of the joint, and upon trial is found to be so far stationary that it bears pressure, and the motion of the skin over it, the assistant is to be employed thus:

He must, with the fingers of one hand, draw aside the integuments which naturally lie over the body to be cut out, and hold them firmly; with the finger of the other hand he must thrust upon the integuments by the side of the body, and into the interstice of the margins of the bones, so that he may prevent the body from moving on that side.\* The surgeon (having his instrument ready to be handed to him) fixes the finger of his left hand on the other side of the body to be cut upon; then with a very sharp scalpel he cuts lightly on the skin until the body starts out or is exposed. As soon as it is exposed the hook is to be introduced behind it, that it may be brought forward. If forceps of a common form be used the body is apt to start from them; they should be armed with sharp crooked claws at the point.

If the loose body escape, the probability is that we shall not be able to bring it to the same spot again, and the danger of the operation will have been incurred without advantage. If the body adhere to the ligaments by a neck, it can be cut away easily, but if it have a broad connexion and require the first incision to be enlarged and a dissection made, it is very unfortunate.

By all means let the wound be closed as quickly as possible. I cannot refrain from expressing my wonder that any one should recommend the incision to be left open for the discharge of the fluid of the joint. The patient must be kept long perfectly quiet, and the wound must be entirely healed before he be allowed to use his leg.

\* Some have recommended that the loose body should be moved upwards on the side of the condyle, towards the connexion of the capsule with the thigh bone. If this can be done, it is certainly better than cutting in the middle of the capsule. But the general rule is to take that position in which the body stands most prominent and secure.

## CHAPTER VII.

## OF FRACTURES.

---

DISTINCTIONS RELATIVE TO FRACTURED BONES.

THE several varieties of fractured bones may be noticed under the heads of 1. Simple transverse fracture. 2. Oblique fracture. 3. Compound fracture. 4. Complicated fracture. The last of these has the greatest variety of important circumstances connected with it.

*Simple transverse fracture* is that in which the bone is broken directly across, or nearly so. It is the consequence of an injury lateral to the bone; occasioned, for example, by a weight falling on the thigh; or by a fall in which the fore arm strikes against a stone; or by a stroke on the arm bone. There is in general, comparatively, little injury to the surrounding parts, and no shortening of the limb from the retraction of the muscles.

*Oblique fracture* is a consequence of force applied in the direct line of the shaft of the bone.



The points of the broken ends of the bone are longer and sharper, and are driven more into the flesh, than in the simple fracture; the fracture is not directly across but oblique, and sometimes the bone is riven up.

There is, in this fracture, a greater difficulty of setting the ends of the bone in due apposition, and in preserving the length of the limb, for the obliquity of the fracture allows the extremities to pass each other.

*The Compound fracture* is where the bone has not only been fractured, but has also pushed through the skin. This in a remarkable manner changes the nature of the case, and the chance of cure is diminished.

*The Complicated fracture*, as I have said, has many varieties, in which the difficulties of the case are increased, and the cure becomes more precarious and tedious. One is where the bone is not merely broken across, but shattered or broken in more than one place. Another is a fracture by gun-shot, which has several essential circumstances quite peculiar. Another complicated case is, where the broken bone has been forced against an artery, and the fracture is complicated with aneurism, or there may be both fracture and dislocation, as frequently happens in the ankle joint. A fracture, where the fissure of the bone is continued into the neighbouring joint.



must be classed under this head. In fracture of the spine too there is more danger from the injury to the spinal marrow, than from the fracture of the bone ; and in fracture of the rib, with injury of the lungs, the importance of the case rests chiefly on the latter circumstance. The danger and all the circumstances of the cases now enumerated being peculiar, they may be ranked under the class of complicated fracture.

Fractures of the skull form a subject quite distinct, on account of the peculiarity of symptoms, and the treatment to be followed, the whole case coming under the influence of a very different principle from that which regulates the practice in cases of the fracture of other bones.

When, in consequence of a fall, the limb is distorted, and evidently fractured, the greatest precaution should be used in replacing it in its natural position, and the patient ought not to be moved from the place until such temporary support be given to the limb, that he may be carried without pain or farther injury from the motion and twisting of the shattered ends of the bones.

When a surgeon is sent for to an accident of this nature, another surgeon being expected, he ought to wait before he examines the limb, that they may together observe the motions and feeling of the limb without occasioning any unnecessary pain.

But if the accident be recent, and the swelling coming on, the surgeon ought not to lose the favourable opportunity for examining the position of the bones and the joints. When the swelling and inflammation have arisen, such examination will often be found impracticable.

If a surgeon come to the side of a patient in this situation, or perhaps after the limb has been dressed, he cannot make the due examination, and ought not to hazard an opinion.

The bone is ascertained to be fractured by the unnatural position of the limb, the hand or foot being generally twisted, or having fallen down ; by the harsh grating feeling communicated to the finger, when placed on the injured part, during

the movement of the limb. In feeling the part, we continue to trace some projecting spine (as of the tibia or ulna), the better to ascertain the displacement of the bones. But this being insufficient fully to inform us of the nature of the accident, we must take the whole limb in our hands, or make a careful assistant do this while we have our hands surrounding the injured part, or, should it be an injury of the chest, we place the hand broad on the side, while the patient breathes.

In performing this necessary office, I need not say that the bone is insensible in its natural state, and before inflammation has arisen, and that the pain occasioned by the accident is owing to the injury of the soft parts: the pain of the operation is merely that of the repeated injury of the surrounding parts by the ends of the bones; so that every unnecessary motion is to be guarded against. But it is of more importance to say that, in the first examination of a limb, we ought to be fully satisfied so as to leave no doubt of the nature of the accident, for if we cannot ascertain the nature and extent of the injury at first, we shall be less able to do so when the swelling and inflammation have advanced; and when that swelling and pain have subsided, the time for remedying the distortion is past; we have lost an opportunity not to be regained.

Where great arteries or nerves run close upon the fracture, (as in fracture of the thigh bone a little below its middle), we must be particularly careful how we move the bone; for by incautiously twisting it, or by the rough carriage of the limb, the artery may be torn upon the sharp ends of the bone.

It may in general be said that, in distinguishing fracture from dislocation, there is in fracture less distortion, and less rigidity of the muscles and tendons, with greater pliancy in the limbs; and that though there is pain, there is yet free motion when the surgeon moves the limb; while in dislocation there is a checked and interrupted motion.

The mere fracture of the bone would in no instance require attention to the system, or any general treatment; but the

bruising and laceration of the soft parts which accompany the breaking of the bone may, by producing and propagating an action distinct from that which would knit the bones, prevent the formation of the callus or new bone. Either the high and inflammatory state of the general system, or an inflammation tending to suppuration of the part injured, will retard the cure; and therefore all that is necessary, all that we can do, is to relieve the system from its high action, to sooth the local inflammation, and as it were, to procure time and opportunity for the ends of the bones to take upon them the change necessary for the formation of the callus.

When, therefore, we have reduced and adapted to each other, the broken bones, (the manner of doing which I am presently to describe), we have to consider the nature and extent of the general or local injury, and comparing it with the circumstances and constitution of the patient, to proceed accordingly. If a person in the full vigour of health be thus suddenly confined to a posture, with a rising pulse and considerable pain, bleeding is indispensable. When there is much swelling in the injured limb, it should be placed in a natural and easy position, but not bandaged; on the contrary, we bleed with leeches, and by fomentation promote the bleeding and allay the swelling. If, from the violence of the injury, and the shock, and the alarm of the patient, fever and delirium succeed, or restlessness with shaking and spasm of the limb, the fracture should be covered with compresses and soft slight bandage, and pillows rather than splints should be applied around the limb. We must wait for returning composure, and the subsiding of the swelling, before we finally adjust the limb.

In this state we must by no means give opiates with the intention of quieting the perturbations before very free evacuations have been made.

If we find restlessness and irritation prolonging the pain and retarding the cure, it most probably proceeds from a neglect of the bowels. By procuring regular motions and by an attention to diet, this irritable state will subside. By still-

ness and want of exercise in a habit perhaps naturally active, accumulation in the bowels is particularly apt to happen, which produces a feverish state. During confinement, free air and a change of the bed-chamber, if it can be accomplished, and recreation, is very necessary, for there is a healthy and natural action to perform.

#### TREATMENT OF A SIMPLE FRACTURE.

By the same force which broke the bone, but oftener by the contraction of the muscles, the broken ends of the bone are pushed past each other. Our first object is, by extension of the limb, again to place the extremities of the bone in their natural relation to each other; next we have to take care that the part of the limb which is below the fracture be made to lie in its natural position, that it is not twisted, and not suffered by gravitation or any other cause, to decline from its proper direction. Thus, if we do not take precautions against it, when the fore arm is fractured, the palm will fall prone and distort the bones: the foot will naturally, by gravitation, fall outward, and lie upon its outer edge when the thigh bone or the tibia is broken.

When the limb is put into what we conceive to be the natural position, we have to observe whether it spontaneously retracts, which it is apt to do if the fracture be oblique. This we must endeavour to counteract.

If I can procure it at the time, I use a pledget of soap plaster, which I put upon the limb, especially on the part where the splints are expected to chafe. But oftener along the limb and in those parts where there are hollows, or a flatness which will not be uniformly embraced by the splints, I lay some layers of lint or old linen soaked in brandy or a solution of crude sal ammoniac in vinegar and water. When we wish to give unity and firmness to these applications, we soak them in gum or in the white of an egg. When stiff unyielding splints are to be used, much of the security and ease of the limb depends upon laying this ground work. By the



placing of these aright, all pressure of the bandage or splints may be prevented on the sharp spines, or on the fractured extremities of the bones, and, where the bones are only thinly covered by integuments, or where the skin is tender.

Further, by the management of these pieces of linen, and these compresses, the necessity of a bandage under the splints is avoided ; for by this means the splints, coming to press equally over the whole limb, (unless on the guarded parts), the limb is uniformly supported by the bandage, which is placed above the splints.

I believe that the bandaging of a fractured limb, before the splints are applied, may be of use, when well done ; but it is always attended with the danger of being applied too tight at first, or becoming so from the swelling of the parts, for in that case it is not merely the undoing of a superficial roller which is required to give ease, but the splints are to be taken off, and the bandage undone, to do which it is necessary to raise the limb from its position.

The splints are to be had in the shops, and every young man can make them. But I would recommend pasteboard to be much used, especially in the lesser splints which may be required, while one larger, of wood, or leather and wood, gives strength to the whole. The only disadvantage of the pasteboard, is, that in the event of rising inflammation and tumefaction, we may wish to apply wet and cool cloths to the part, by which the splints are softened ; but still if the larger splint be firm, it will be a sufficient guard. When there is an evident necessity, in the beginning, for fomenting the limb, it ought to be laid out on the tin splint.

It will be understood that I apply the bandaging over the splints. I have only to add, that we ought not to use one very long roller, but lesser ones, distinct in their attachments ; and that the one last applied should always be the tightest, for if the limb swells too much, or there is pain and uneasiness, we ought to have it, in our power to ease the whole, by undoing the outermost bandage.

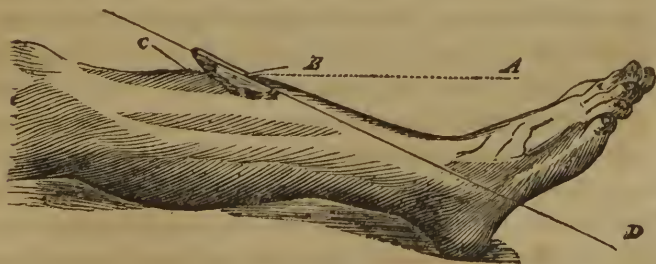
If the first turns of a roller be tight, the whole must be undone before we can loosen these ; but if it be lightly put round at first, and then with increasing tightness, then merely to unpin it, and undo one or two turns, gives relief. In most cases the eighteen tailed bandage is to be preferred to the roller.

When we bandage a limb for whatever cause, we must support the lower part of it by a few turns of the roller ; else a fulness and kind of strangulation, as it were, will take place in the hand or foot.

In regard to the position in which the broken member is to be laid, we may say in general that the joint is to be relaxed, or the limb placed in a half-bent position ; there are exceptions to this rule, but we shall reserve this part of the subject until we come to speak of the particular accidents.

In laying a limb with a COMPOUND FRACTURE while the general principle remains the same, some things must be differently managed from the simple fracture.

We have already remarked that there is a real and important distinction in the simple and compound fracture, arising from the mere breaking of the skin, or the external wound. Our first care then is, if possible, to reduce the accident to the nature of a simple fracture, by securing the healing of the external wound. But perhaps the bones project and cannot easily be withdrawn from the wound.



This plan will shew that when the end of the broken bone projects, the direct extension of the limb is improper, it forces the sides of the bones against each other, and the upper

broken portion of the bone into the flesh.—If we were to pull this leg in the direction A, then B, would be forced against C, and the sharp point C, forced into the flesh, and the wounded integuments would be girt round the ends of the bones. We must therefore extend the lower part of the leg in the axis of the lower end of the bone, in the direction B, D, until the two ends of the bone are no longer thus locked into each other; then raising the foot into the position A, the parts are adapted to each other.

If there project through the skin a long splinter of the bone, which we foresee cannot well be retracted, or perhaps without injury to the surrounding soft parts, then it had better be taken off with the saw.—To saw or break off the projecting point is better than to cut up the integuments.

When the bones are replaced, our next object ought to be so to adapt and bring together the integuments, that they may unite by the first intention. They ought to be brought together by a slip of plaster, if they admit of it, and over this a piece of dry lint should be laid on lightly, so as to absorb the first exudation; this may be covered by a piece of cerate; but nothing oily should touch the wound, where we hope for the scabbing and healing of the broken skin.

In other respects the limb is to be managed as a simple fracture, only that in the bandaging we should not use a roller, but the eighteen tailed bandage; and in applying it by leaving such tails, as cover the wound, hanging out untied, till the rest are bound up, they can at any time be unpinned and taken off, to expose the wound for the convenience of dressing, without moving the rest of the bandage, or disturbing the limb.

But a compound fracture in the common application of the term, may be a bruised and lacerated limb, complicated with fracture of the bone; not the effect for example of a shock in falling, which breaks the bone and pushes it through the skin; but of the injury received by a waggon wheel going over the limb, bruising and cutting and laying open the shattered bone. Here, of course, the reduction and po-

sition of the bone is our least care. The inflammation in a good constitution must rise to a great height ; in a bad constitution the natural high action, (a necessary consequence of a previous healthy state of the body in these circumstances), may be converted into bad inflammation, and have a tendency to gangrene\*. We have to study the previous state, and watch the present symptoms ; relieve the high activity by bleeding and every relaxing means, lower the irritation, or correct the habit ; and as to the limb, to lay it easy is our only aim, until the high tumefaction and pain shall have subsided ; then suppuration will also have taken place.

Good suppuration ensures the subsiding of the inflammatory tumour, and of the high tension and irritability. But if after a time, the discharge continues and becomes profuse, there is either a cause of irritation in the wound which may be removed, or the constitutional powers have been allowed to go too low. By probing gently, perhaps, a loose piece of bone may be removed, with an immediate change in the complexion of the wound ; or on examination of the parts we may discover a lodgment or sinus, which were better opened.

When the pulse indicates rather the quickness and irritability of langour or exhaustion, than of inflammatory fever, by changing the plan of diet, and general remedies, and by supporting the system, we may restore due energy to the bodily powers.

When the languor increases, the appetite fails the perspiration is copious and easily excited, and a purging threatens to reduce the patient to a still greater degree of weakness ; then bark and wine, mild nourishing diet, and free air, if possible, are our resources. After this, the patient still sinking, and the integuments losing their tumefaction, and becoming loose and flabby ; and from the unfavourable state of the bowels, the food having ceased to be nutritious while

\* In practice it is of the utmost consequence to ascertain the state of the soft parts—a fracture with contusion, though we must call it a simple fracture, is often worse than a compound fracture.



wine and brandy give but a temporary excitement, without returning vigour, the question of amputation comes to be discussed. If the powers of the constitution be not entirely exhausted, so that there is not vigour to produce the necessary tumefaction, and adhesion of the flaps on the stump, amputation will be safe.

There is one point of doctrine on which I believe it necessary to say a few words in these introductory remarks. It regards the nature of callus, and the question concerning the extent of motion which may be allowed to a fractured limb.

If this book possess any merit in proceeding directly to that point, the consideration of which most embarrasses the surgeon, it results from my having observed the difficulties which my house pupils experience in fully comprehending their teachers, and from attending to their remarks and their reasoning. It was only a few days ago that I heard a very ingenious young man, who lives with me, say, that the fractured thigh bone should not be set until the end of the third week; and he supported his opinion by the practice of an hospital surgeon of some reputation. A short and energetic expression of my conviction of the folly of this dogma would not carry the same weight with it here as I hope it did with my pupil. I shall therefore insist upon it more at length, and discuss also the question of the degree of motion to be allowed to a limb in fracture, somewhat largely.

I have before me the short notes of three dissections, which, if I mistake not, afford me full ground upon which to reason securely.

1. The first describes the state of the parts immediately after the fracture. The bones have suffered a complicated fracture, being much shattered; they hang together by the surrounding cellular membrane, and the periosteum—they are surrounded with coagulated blood.

2. The second refers to a fracture of the thigh bone, if I recollect, three weeks after the fracture occurred. "The bone has been broken across in two places, leaving an intermediate portion. The intermediate portion is immersed in a sub-

stance, which to the eye is like jelly, but which has a considerable degree of toughness. It appears as if the periosteum were continued from the circumference of the bone; yet this cannot be. There is here a new formed membrane, which in time would have been the periosteum of the new formed bone. This periosteum is remarkably strong and thick, and the toughness which it has in a remarkable degree is possessed also by the callus to a considerable depth. In this mass I discover with my hook or probe many distinct particles of bone."

3. In a preparation of a fractured bone, which had been firmly knit together, and which after being injected had been made in a degree transparent, I observe the old bone white and little porous, but the new formed bone which unites the old portions is more vascular, and deprived in a greater proportion by the acid of its phosphate of lime.

From these facts, without entering upon a physiological view of the subject, I shall endeavour to draw the practical lesson.

When the injury is first committed, the cellular membrane around the broken bone is torn; the lesser vessels are opened; and the blood is unusually effused. At this time any slight motion of the bone does no harm unless it tears up new parts. Presently the blood is absorbed; the injured parts throw out a more regular secretion; the membranes form new adhesions to the bones; a tough membranous substance unites them, and in the apparently confused mass, which surrounds the extremities of the bones, small irregular points of bone are formed. Is not this sufficient to give conviction that if the limb be rudely moved after the new adhesions are formed, these adhesions must be again torn up? and if these particles of bone be formed, must not the motion of the limb cause them to cut and tear the vessels and membranes by which they are surrounded? so that at last if this motion be allowed to any extent, the disposition to the formation of bone is destroyed, and the process baffled as it were, in its design, stops short of the true effect, and the bones are united not by bone but by a tough ligamentous substance,

and the extremities of the broken bone are rounded off, so that an artificial joint is formed. It is surely no erroneous conclusion to draw, that motion, to a certain extent, will destroy the disposition in the action to unite the bones by bone; and that in a lesser degree it retards the cure, and makes the confinement longer, increasing the chances of failure. On the other hand, no argument will ever be discovered against giving absolute rest to the limb.

But we must not be so blinded as to carry the argument too far. If, on examining a limb, we find that it is distorted or retracted, we place it again in its proper position, and endeavour more perfectly to secure it, because by this twisting or extension we do not, as by a perpetual teasing interference with the process going forward, destroy the usual disposition. Here the new adhesions may be broken, and they will readily unite again, and the cure go on.

To say, however, that because we can thus interfere with a broken limb, without essentially interrupting the cure, it is time enough to set the limb in its position after four weeks have elapsed, were to carry the doctrine to a dangerous as well as a ridiculous excess; for at such a distance of time from the accident, the connexions must be strong, and the violence necessary to replace the limb in its natural situation proportionally great. It is but at best bringing matters to their original state, and of course the previous time is lost; the confinement being in this way much increased. We can ascribe such extravagant practice as this, only on the one hand to ingenious argument pushed rather too far for common readers, and on the other to stupidity in taking the illustration of a doctrine for the enunciation of a principle. A fractured bone will feel quite loose towards the end of the third week, and in three or four days more it will be firm. This, I suppose, is the origin of the opinion, but the fact is insufficient to establish the rule of practice.

OF THE MEANS PROPOSED FOR EXCITING THE OSSIFIC ACTION  
WHEN A JOINT HAS BEEN FORMED IN CONSEQUENCE OF THE  
MISMANAGEMENT OF FRACTURE.

WHEN, in consequence of using the limb too freely a joint has been formed, instead of the bone uniting, it has been proposed, to cut down through the flesh, and to cut off the callos extremities of the bones. I do not recollect that this has ever been done with success, but I know that it has been done with continued pain, during the operation, almost to death, and with no good effect. The thigh has been cut so that the bone has been exposed, but lying deep in the flesh; the disentanglement of the end of the bone has been found most difficult, painful, and tedious; the saw moving in these deep parts requires a large wound and moves with difficulty, and in one case, long before one extremity of the bone was cut off, the patient was pale and feeble, and incessantly vomiting from pain and irritation. I believe hours have been spent in the attempt, and what has been the result? an extensive open wound, the ends of the bone consequently exposed, and these ends injured by the working of the saw. A disposition in short is left upon the part the very reverse of the quiet ossific action. There follows inflammation and suppuration, (ever at variance, with healthy ossification), the inflammation has subsided, and when the parts may be expected to granulate and take the disposition to unite by bone—that disposition has been already destroyed by the violence of the inflammation, the time for their union is past, and the bones remain loose as before.

In one case I thought myself, by observations made on animals, authorized to propose that a long and sharp instrument should be pushed obliquely down upon the bone, so as to work upon and penetrate the extremities of the bones. By this means I imagined the wound made by the transit of the instrument would immediately heal, and yet the extremities of the bone be so excited as to resemble the state of



simple fracture more than can possibly happen after cutting down upon and sawing their ends. But perhaps the patient reasoned better than his surgeon since he would not submit. I still insist on the necessity of absolute rest after such operation for re-union of bone.

## FRACTURE OF THE CLAVICLE.

THE clavicle may be broken by a blow directly upon it; but it is most commonly broken in consequence of the person pitching on his shoulder as in falling from horseback. The fracture of this bone is ascertained by remarking that the shoulder is fallen down towards the breast, and, on feeling along the bone, the crepitation of the broken ends is perceived, or the broken ends are found to have passed each other and one of them to ride upon the other.

The motion which the patient makes with the greatest difficulty, is to touch the shoulder of the opposite side, or to raise his hand to his forehead: for this motion twists the broken clavicle, and forces the broken ends into the cellular membrane.

The indication is to keep the shoulder from falling forward and the arm from dragging. If the patient be drunk, compresses are to be put over the tendons of the pectoralis major, and a figure of 8 bandage to be so applied as to draw the shoulders powerfully back, that no struggling or thoughtless motion be allowed, which might tear the parts against the sharp bones.

When the bone is to be set, an assistant draws back the shoulder, while the surgeon examines the position of the bones; and when the broken ends have been drawn into their natural relation, some flat compresses of linen are to be placed as directed before the arm-pits, that the bandage may not cut the skin. The double-headed roller is now to be applied: putting the middle of the roller across the back, the surgeon brings two turns under the arm-pits and over the shoulder, then, by crossing the roller on the back and

again bringing the turns to bear on the shoulders, they are retained braced back; after a few yards of the roller are thus applied, the shoulders are fixed, and the arm cannot fall forward.

Now a soft cushion, or pad of lint, is to be placed in the axilla, and the turns of the roller being secured, the end is to be brought down upon the back and outside of the arm, so as to bear on the elbow and brace it to the side. This in consequence of the compress being in the axilla, still further removes the shoulder from the sternum, and keeps the broken ends of the bones from passing each other.

If the bones come easily into their place, then the pad need not be applied in the axilla until after a time the roller is somewhat loosened by stretching, or it be necessary to make some substitute for the severe bracing of the roller.

When the shoulder is braced back, we must notice if the bones be on the exact level. And at all events, it is necessary to sling the arm, to prevent the falling down of the outer portion of the clavicle; for this purpose the fore arm is put in a large handkerchief, the ends of which are to be tied round the neck.

No kind of compress must be allowed on the ends of the broken bones, for they are ineffectual as to keeping the bones in their place, and only press the tender skin against the sharp bone. If it be found that the patient is often feeling and pressing the bone, it may be well to put a piece of leather spread with adhesive plaster, over the clavicle, simply to keep off his fingers.

#### FRACTURE OF THE ACROMION PROCESS OF THE SCAPULA.

When the shoulder is black and blue, and it is found that the patient has pitched on it, but yet the clavicle is not broken; and when there is crepitation on pressing the prominent part, and some disfiguration of the shoulder joint, we shall find that the acromion scapulæ is broken. But the fracture of the acromion is even more apt to be a consequence of a

weight falling on the shoulder, than of a person pitching with the shoulder to the ground.

If the acromion process be broken, we see on taking hold of the arm of that side and either pulling it down, or letting it drop with its own weight, an evident sinking of the top of the shoulder; or on applying one hand to the shoulder, while with the other we move the arm, a crepitation is felt. On pushing up the arm bone, there is pain, and we see the point of the acromion unnaturally elevated.

In fracture of the acromion scapulæ (which, by the bye, is not a frequent accident, owing to the weakness of the clavicle,) we raise the arm, and relax the deltoid muscle, and examine and replace the pieces of the bone. Then the arm being allowed to fall gently down, the fore arm is to be suspended in a handkerchief, so that the head of the humerus may be made to push up the extremity of the broken acromion, and preserve it in its place. As this injury proceeds from a direct blow on the part, the pain and tumefaction of the integuments of the shoulder will be great, and no bandage can be applied with advantage until the swelling has subsided: then the spica bandage may be put on. The spica bandage is a form of applying the double-headed roller. The middle of the roller is put under the arm-pit of the opposite side; then the ends are brought up and crossed on the top of the wounded shoulder; then they are crossed under the arm-pit of the same side; they are then carried across the back and breast, and the heads of the roller are again crossed under the arm-pit of the opposite side, and so are carried up on the injured shoulder again—and this is repeated until the shoulder and the broken bones are covered with a firm lacing of the bandage. It may be necessary to relax the deltoid muscle, in order to keep the bone in its place. If the acromion be allowed to unite with its point depressed, it will check the motion of the arm bone.

## OF FRACTURE OF THE BODY OF THE SCAPULA.

OF the other parts of the scapula, the inferior angle is exposed to be fractured next in degree of frequency to the acromion process. It may be broken by falls or blows. I have been consulted by a person complaining of a great pain in the lower part of the shoulder blade from a fall, and yet I have found that this part never touched the ground or received a direct injury; but had been injured by the sudden action of the latissimus dorsi on the angle of the scapula in the sudden twist of the trunk, and in the exertion to save himself from falling.

There is sometimes a dislocation of the tendon of the latissimus dorsi, in consequence of the angle of the scapula getting over the tendon, so that the arm cannot be carried forward or lifted.

When there is fracture of the lower part of the scapula, we have to press the fingers around the lower angle of the scapula, as if to fix it; then, raising the patient's arm, so as to roll the body of the scapula, if the lower angle be broken off, it does not follow the motion of the body of the bone. It is not practicable to bring the lower piece to answer to the body of the bone; but by managing the position of the arm, the body of the scapula may be brought to meet the lower piece, and to come into accurate contact with it. To effect this, we carry the patient's elbow forward on the chest, and when we feel that the parts of the scapula correspond, we place the palm of his hand on the opposite pap and bind the arm to the chest: for this purpose the fore arm is to be slung in a handkerchief, and pads or compresses put betwixt the arm and scapula; and then a broad roller is applied round the body, including both the chest and the arm of the injured side.



## FRACTURE OF THE HUMERUS.

THIS is the simplest of all fractures. It requires only two pasteboard splints, one on the inside and the other on the outside of the arm. The fore arm should be hung by a handkerchief, in such a manner that the wrist may be more supported than the elbow, so that the weight of the arm, counteracting the action of the muscles, may serve to keep the ends of the bone in their proper place.

I have seen the imperfect joint formed in the arm bone oftener than in any other. We must endeavour, in this case, by rude motion, to excite inflammation in the ends of the bones, after which the steady binding of the arm with splints, will certainly succeed in uniting the bones.

The humerus may be broken very near its head; the neck of the humerus cannot be broken, because there is, in fact, no neck; but, in a young person, the head may be broken off at the joining of the apophysis. This has been the consequence of the recoil of a musquet, when a lad, in firing his piece, has not rested it on the shoulder, but on the arm bone.

Fracture of the humerus, near the head of the bone, is unfavourable, because of the strength of the muscle which surround it: the pectoralis major and latissimus dorsi, the deltoïdes and teres major, act on the lower piece of the bone, and make an essential difference in the case from that of the simple fracture of the middle part of the bone. The force of these muscles should be counteracted by the weight of the arm, slinging it by the wrist only and not supporting the elbow. We must in this case too, be careful to adapt a splint to the inside of the arm, with such a pad as may fill the axilla without too much encroaching on the head of the humerus, or in the least pushing it from its place; then a piece of pasteboard is to be moulded to the shoulder, and the spica bandage applied and continued in the form of a roller on the arm.

## OF THE FRACTURE OF THE OLECRANON.

THE olecranon may be fractured when a person in running falls, and strikes the elbow on the ground.

No marks are required to distinguish when the prominent process of the ulna at the elbow is broken off. It will, however, be observed that this makes quite a peculiar case from the circumstance of the strong triceps muscle being inserted into the process of the bone which is broken off. The bent, or relaxed position of the limb, which is the position of ease in most fractures, would here have the worst effect, by making the body of the ulna recede from the process which is broken off and attached to the tendon of the triceps.

Let the fore arm be extended; yet not to the utmost stretch. Then the triceps is to be pressed, with a view to relax it, and the olecranon brought down to its place. Dossils of lint are then placed on the sides and above the olecranon; and over these a roller is put on the arm and fore arm. A splint must then be applied on the fore part of the elbow joint with lint beneath it, to fill up the inequality of the joint, so that the fore arm may be prevented from extending fully to the straight line; and, at the same time, prevented from being bent at all.



These cautions are to be attended to; because, in the first place, by extending the arm too much, the olecranon, which has been broken off is pushed from its notch in the lower head of the humerus; and consequently it does not perfectly and correctly unite with the body of the ulna. In the na-

tural state of the joint, the olecranon checks into the hollow of the humerus so as to stop the motion at its due limit, but that check being now done away, the fore arm may be bent back unnaturally, and the ligaments of the joint strained.

In the second place, it must be observed, that if the joint be not enough extended when the bone is set, callus or new bone will be formed betwixt the ulna and the process which has been broken off, and a kind of ankylosis is the consequence; for the olecranon process projecting now too far, will strike into the hollow of the humerus, before the fore arm can be fully extended.

See plan plate IV. fig. 4. A, is the humerus; B, the ulna; C, the olecranon, broken off; D, the hollow of the humerus, into which the olecranon should sink, when the arm is fully extended. But it is evident, that if the dotted line betwixt B, and C, be filled with new bone, there must be a stiffness in the joint, of the nature of ankylosis.

#### FRACTURE OF THE RADIUS.

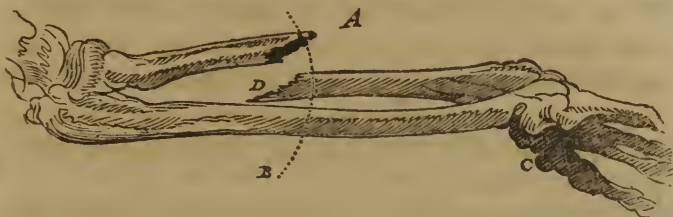
THE fracture of the radius may be the consequence of a direct blow on the fore arm; or of a person's falling and endeavouring to save himself, by extending the hand; for the carpus being articulated with the radius, the whole shock and weight of the body falls on this bone.

The nature of the injury will be ascertained by the usual symptoms of fracture: and, besides, it will be found that the hand falls prone, with much pain, because the weight of the hand bears so that the carpal bones and lower head of the radius turn on the small head of the ulna, while the upper part of the radius, not following the lower in its rotation, the broken ends are separated, and the surrounding parts injured.

The patient therefore comes to you, holding the palm of the injured arm with his other hand, to prevent the motion either of pronation or supination, but especially the former.

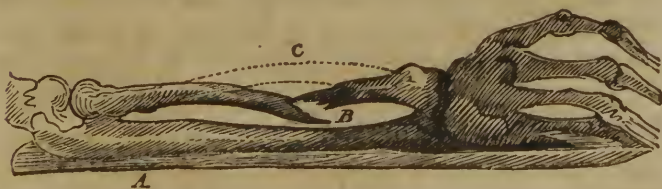
The effect of pronation will be understood by looking to the annexed sketch of the bones of the fore arm. A, is the upper

broken part of the radius ; D, the lower portion : now by the falling of the palm C, prone, the portion D, turning in the circle A, B, is separated from the upper portion of the bone, and the tearing of the cellular substance, or the bearing of the sharp bone against the parts, is the cause of the pain.



It will be manifest, at the same time, that, if the bone be allowed to remain in this position, a great, irregular callus must be formed betwixt the ends of the bones ; and that, when they are thus fixed together, the hand will be no longer capable of supination.

In setting the radius when fractured, we have to apply the splints thus : one along the inside and the other on the outside of the fore arm : The one on the inside should be long enough to reach to the palm, that it may prevent pronation. It is important to observe that if a splint be laid along the ulnar edge of the fore arm, and be made to reach to the palm ; or if the arm and hand be laid carelessly in a sling, the following bad consequence results : the ulnar edge of the palm is pressed up, the head of the radius receives that pressure, and the broken ends of the bone are pressed down upon the ulna, as is expressed in this sketch.



A, is a splint, on which the arm and hand rest. Now it is evident that, when the ulnar edge of the hand is thus raised,



the radius can no longer keep its natural shape, as indicated by the dotted outline, C; but that, on the contrary, the sharp and broken part of the bone will be pressed near the ulna, as at B.

The consequence of this is, some distortion of the wrist, and an impediment in the rotation of the radius and hand.

#### FRACTURE OF THE BONES OF THE HAND AND FINGERS.

THE bones of the carpus and metacarpus are seldom broken, without being accompanied by a bursting, or laceration of the integuments. The hand is caught in machinery, or injured by the bursting of fire arms—the fracture of the bones then is the least of the evil. As to the setting of the bones, that is an easy matter: to preserve them in their natural situation, the palm of the hand is laid over a cushion or pad, accurately adapted to the hollow of the palm and fingers, and then a roller is to be brought down from the fore arm, over the hand and wrist, including the pad.

When the bones of the fingers are broken, they are to be neatly set, with pieces of paste-board, moistened and soft; over which a small roller is applied, and to secure the position of the fingers, if several have been shattered, they may be laid over a small cushion, so as to embrace it.

#### OF THE FRACTURE OF THE THIGH BONE.

It is evident, on the first consideration of the subject, that, in the fracture of the thigh bone, these circumstances must make a peculiar case:

FIRST, The great strength of the bone which implies that there must be great violence and injury done to the limb, at the same time that there is fracture.

SECONDLY, The magnitude of the thigh, and the great proportion which the injured part bears to the whole body should lead us to infer that the injury to the system and the effect on the constitution, will be, in a good measure, propor-

tioned to the size of the member which is injured and the violence it has suffered.

The **THIRD** consideration is, perhaps, the most important one—it relates to the great mass of flesh by which the bone is surrounded. For this great mass of muscle being in unceasing action, the lower portion of the bone, on which it operates, is drawn towards the body, so as to make the broken extremities of the bone ride over each other; which, in the end, often occasion a short and lame thigh for life.

Lastly, we must take into account the position of the thigh bone: for, as it stands nearly perpendicularly under the weight of the body, and is broken most commonly by a shock perpendicular to the pillar of the bone, it must be liable to be rent and fractured obliquely.

There are very important distinctions to be made in relation to fracture of the thigh bone, from the circumstance of the place and direction of the fracture.

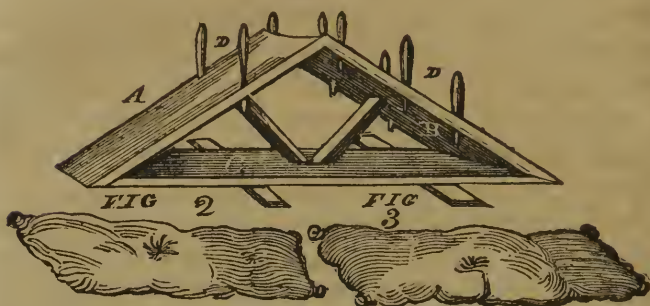
#### FRACTURE OF THE SHAFT OR CYLINDRICAL PART OF THE BONE.

WHEN the cylindrical part of the thigh bone is broken, we should consider well the place and degree of obliquity of the fracture, before we speak of the event. The higher the bone is fractured, the greater probability is there that the limb may be shortened during the cure. The reason is that the nearer to the upper end of the bone the fracture is, the greater is the number of muscles inserted into the lower portion, and the greater the retracting force. But if the fracture should be at the lower head of the bone, and also oblique, (as it is apt to be in that case), then is there danger of the bone uniting with an oblique position of the condyles, producing distortion and weakness of the knee-joint.

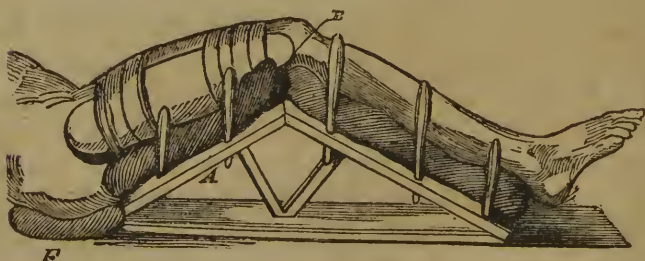
In the treatment of the fractured thigh bone, we have many things recommended, and a variety of apparatus advised, because, in truth, every surgeon has experienced difficulty and disappointment in managing it. What I have now to

offer will, I hope, be found simple, and, in proportion to its simplicity, effectual, for securing the limb in the best position.

FIG. 1.



It will be necessary for the first night to secure the limb with the common splint and bandage and lay it out on a pillow. In an hour this frame may be constructed: two boards, A, B, Fig. 1, of ten or eleven inches in breadth and of a length equal to the distance of the heel from the back of the knee-joint, are to be united at an angle answering to an easy and relaxed flexion of the limb, and secured by a horizontal board C. Near the edge of the inclined boards, holes are to be made and pegs of wood fitted to them, D, D. Cushions, like Figs. 2 and 3, are then laid on this frame, when it is ready to receive the limb.



The limb is to be laid over the cushions or mattresses thus supported on their frame. The bone is now to be accurately set, (if it has not been already done), by the assistant taking the knee and gently extending it, while the surgeon puts his

hand wide over the thigh and the fractured part, that he may feel the crepitation and the motion which the broken extremities of the bone suffer. Now one long splint is to be laid on the outside of the thigh, reaching from the hip to the side of the knee, another upon the inside of the thigh and over these the eighteen-tailed bandage is to be applied.

It is now to be observed how far the thigh answers to the inclined plane, A; for it will be understood, that the thigh and body, in some degree, now hang upon the angle of union of the two boards, and that if this board, A, be much longer than the thigh, the muscles of the thigh will be strained. If, on the contrary, it be shorter the muscles of the thigh will act, and the broken ends of the thigh bone may ride over each other, notwithstanding the lateral splints and the bandage. To ease the muscles of the thigh, we must raise the hip, by placing a thin cushion under it at F: To stretch it, we must take the cloths from under the hip, or make the pad larger under the knee joint at E. To support the foot from rolling, the edges of the pillows or mattresses are folded up and fixed by the pegs so as to give a lateral support to the whole limb from the hip to the ankle.

If the thigh has been much bruised and be now swoln, perhaps it will be better simply to lay it out on this frame without splints, for it will be soft, and be equally supported, and moderately stretched.

What is the most frequent kind of defect in the limb after fracture of the thigh bone? There can be no doubt that it is shortening of the thigh, together with a twist of the limb, which lames the patient by depriving him of the strength from the muscles of the leg, and takes at the same time the length of the foot from the step of that leg. We have now only to consider the latter of these effects of inattention; having, as we hope, done all that can be done, by the substitution of a simple contrivance, and by making the weight of the body the counterpoise to the strength of the muscles, to prevent the retraction of the limb, and consequently the permanent shortening of it.



When the limb is merely laid on the outside, and gently bent, as directed by Mr. Pott, and secured by splints and bandages, the body and limbs of the patient lie well, for some little time; the thigh rests on its outside, and the body is inclined the same way: but, by and bye, the patient turns directly on his back, while the leg remains lying with the outside of the foot flat to the bed! Or, again, if the limb has been set with the patient lying on his back, and the heel of the broken limb to the bed, the weight of the foot in a short time twists the leg, so that at last it lies flat on the fibula, while the patient continues on his back. This could not take place was the thigh bone entire; but now the lower piece of the thigh rolls outwardly, while the upper part remains in its place. The bones thus twisted, unite, and, when the patient rises from bed, we find that he points the toe too much out in walking, that he carries the side of his foot forward, and has consequently lost the use of the elastic arch of the foot.

This sketch will illustrate my meaning.

FIG. 1.



In Fig. 1, I have given a sketch of the limb, as I have seen it lying—the knee bent, the side of the foot flat on the bed, the leg shorter; (though this is not easily ascertained, from

the different aspects of the limbs), while the patient lies flat on his back.

Fig. 2. shows what has taken place—that the broken ends of the bone have shot past each other, by the retraction of the muscles, while the lower part of it is twisted outward, by the falling of the foot on the outer angle, there being no impediment to this motion from the trochanters and the hip joint as when entire.

#### FRACTURE OF THE EXTERNAL CONDYLE OF THE THIGH BONE.

WHEN we turn our attention to the natural position of the thigh bone, or when we place the condyles of the bone on the table, we find that the shaft, or cylindrical part of the bone, stands obliquely. So it happens that, in a person who falls on his feet, the weight of the body operates obliquely, and the external condyle receives the shock. In this way, there is sometimes an oblique fracture of the lower head of the thigh bone, and the external condyle is broken off. The utmost care is required to prevent the inflammation rising in the first instance, and to provide against obliquity in the joint.

## OF FRACTURE OF THE NECK OF THE THIGH BONE.



*This is a sketch of the bones of the person mentioned in the text. The right thigh bone is natural, the left one much shortened by the fracture of the neck. A, the os Innominatum; B, the shaft of the thigh bone; C, the neck of the bone fractured; D, the trochanter major broken off. The comparative elevation of this point above the level of the head of the bone, will mark the reason of the shortening of the limb. The pieces of bone were united by a ligamentous substance, not by bone.*

WHEN we hold the thigh bone before us, and consider the position of the great shaft of the bone, and the obliquity of

the neck, standing off at an angle to the shaft or pillar of the bone; when we consider the strength of the shaft, or cylindrical part of the bone, that it stands almost directly under the weight of the body, and that the neck of the bone, on the contrary, is smaller and weaker, as well as oblique,—we see why, in all shocks from the descent of the body upon the thigh bone, the neck is the most apt to be broken across.

The neck of the thigh bone then is broken when the weight of the trunk falls upon it; as when a person falls from a height upon his legs, or when thinking that he has come to the landing of a stair, he steps forward and falls down two or three steps, with a shock which the neck of the thigh bone cannot bear. A direct blow on the joint injures it, but there is no fracture: a twist of the limb dislocates or injures the apparatus of the joint, but there is no fracture. It is only the perpendicular impulse that can fracture the neck of the thigh bone\*.

I have dissected the joint some months after the fracture of the neck of the thigh bone, and have found the bones still loose. There was at least only a very imperfect union betwixt them, by a strong and irregular ligamentous matter. I mention this not as a curiosity, but in confirmation of a general opinion, that the neck of the thigh bone will not unite, not readily, in the usual way by bone.

It is of importance to notice the motion of the hip joint on almost every occasion; in the natural state of the parts, indeed, we are aware of every motion to which it is liable; but when the sensibility of the joint is increased by disease or injury, we discover, that scarcely a muscle of the limb moves without moving the thigh bone in the acetabulum: and that the patient does not move his trunk in the slightest degree, but the pain of the joint is excited by the motion of the joint.

\* Although at this time, when I am correcting the sheet, I am made sensible that a man may fall on the trochanter, and break the neck of the thigh bone; yet I am convinced it is so little likely to happen, that I venture to keep the text as it stands.



This perpetual motion of the head of the thigh bone, is a principal cause why, being broken, it does not unite.

Certainly too, there is something unfavourable in the circumstance of the neck of the bone being surrounded by the secreting and lubricating capsule of the joint, not by the cellular membrane, and vascular muscles, which embrace the broken ends of the bone in other fractures. The broken head and neck of the thigh bone, must be deprived of that due degree of inflammatory action of the surrounding parts which is necessary to sustain and consolidate it. But having seen the fracture of the neck of the bone, with a breaking up of the whole trochanter major, and part of the shaft of the bone, while yet there was no union by callus; I cannot attribute the defect of ossification entirely to this circumstance of the difference in the nature of the surrounding substance.

The great strength of the muscles surrounding the joint, sufficiently explains that most untoward circumstance, the shortening of the limb, in fracture of the neck of the bone. The whole strength of the muscles of the hip, of the psoæ muscles, and of the muscles of the thigh, is operating incessantly in the retraction of the cylindrical part of the bone. To counteract this dragging of the muscles, I know nothing more effectual than laying the limb on the frame which I have already described, I do not imagine that any splints about the thigh or joint, or any kind of bandaging, will be more effectual to retain the limb in its natural position.

It is particularly necessary to point out the distinctions betwixt this fracture and the dislocation of the head of the thigh bone.

1. In the first place the surgeon has to attend to the crepitation, and for this purpose he puts his hand on the joint, while the limb is moved. But it must be recollected, that the effect of mere inflammation in the joint is to change the secretion of the sinovia so much, that the cartilages move with less facility, and produce a jarring sensation, which may be mistaken for crepitation.

2. We next attend to the ease with which the limb is stretched. By a majority of consultants, I was induced, contrary to my own opinion, to put the apparatus on an old woman, and to endeavour to reduce what was supposed a dislocated hip; but placing my hand on the trochanter major, and pressing a finger of the same hand on the prominence of the ilium, I knew decidedly at the first motion of the assistants to pull the limb, that it was no fracture, from the ease with which the trochanter moved, and from the increase of the space betwixt the ilium and the trochanter.

3. In dislocation, the limb is locked as it were; but in fracture, it is easily moved, in as far as regards the surgeon, though with pain to the patient. And when the limb is moved in fracture, it is with a certain degree of elasticity; but in dislocation, by starts, and unequally.

4. When we make an assistant take hold of the knee and ancle, and bending the knee joint make the rotatory motion of the thigh bone by using the leg as a lever, we may observe the following distinctions betwixt fracture and dislocation:—When the heel is moved out, the head of the thigh bone checks against the back of the ilium in dislocation; whereas in fracture it has no such impediment. Again, when we make the assistant roll the thigh, while we keep the fingers on the trochanter major, we feel it, in dislocation, making a movement describing a part of a large circle; but in fracture, it moves on the centre of the cylindrical part of the thigh bone, to which it is nearly parallel, and consequently does not escape from under the finger.

See further under the head of Dislocation of the Thigh Bone.

As I have said, I conceive that the frame which I have recommended, in the fractured thigh bone, will do all that it is possible to perform in the present case; it will retain the thigh bone, and the great trochanter, in their natural place and relation to the neck of the bone. But lest my reader should object to this, and think that it is better to assist the operation of this frame work by bandaging and splints, or

would rather trust to the general experience of the profession, than to my suggestion, he may take the following method :—

You extend the limb until by marking the relation of the trochanter major to the ilium, you find you have brought the bones into their due relation to each other. You then lay compresses above and on the sides of the trochanter ; then a roller is put round the pelvis and thigh, so as to keep these compresses and the bone firm. (So far it may be well to do before laying the limb out on the inclined planes—I object to what follows, as inefficient). A long splint of wood is now to be put along the whole thigh, fixed at the upper part by having the end pushed into the folds of a bandage or belt, which goes round the pelvis ; while to the lower part are attached bandages, which go round the knee and ancle, and which may be drawn so as to stretch the limb.

#### OF THE FRACTURED PATELLA.

THE fracture of the patella, or knee pan, happens in consequence of a sudden and very strong action of the four muscles which are inserted into it while the knee is in that degree of flexion that the patella is raised upon the convex surface of the lower head of the femur. Sometimes the patient observes that the crack of the fractured bone was before he fell to the ground ; while, for the most part, deceived in the circumstances, he supposes that in striking the ground, the knee pan has been fractured. It must, at first view, appear strange, that the patella can be broken by the mere force of the muscles ! but two things are to be considered, the great massiness and strength of the muscles which operate on it, and the position of the patella.

The muscles which operate on the patella, are the *rectus*, the *vastus externus* and *internus*, and the *crureus*. These which may be called a quadriceps muscle, raise the whole weight of the body, and are powerful in their ordinary action. But when a man slips his foot, and I may say the whole mus-

cular frame is brought into sudden and almost spasmodic action, the power of those muscles is inconceivably great. Again, the patella cannot be broken when the muscles pull directly in the line of the bone; that is, when the limb is straight; nor yet when the knee is so bent that the patella lodges betwixt the bones, and is supported by the condyles. But when the knee is moderately bent, and the patella is raised on the convexity of the lower head of the thigh bone, the muscles act at an angle with the ligament of the patella, and then the patella is broken across. The patient falls to the ground, and the surgeon finds that instead of the usual prominence of the knee, the joint is flat, and he feels the greater portion of the patella drawn upward on the thigh, while the other part is still attached to the ligament, and the two condyles of the thigh bone, are prominent.

*Treatment.*—Let the surgeon avoid all motion in the limb, or at least bending of the knee joint, else there will be further danger of laceration. If the patient is to be carried home, in order to be quite safe, he has only to be carried sitting upright in a chair, with his leg extended. There is no occasion for a bandage to secure the upper portion of the patella, from being drawn further up on the thigh.

When the patient is laid in bed, we have to bring the fractured portions together: first, by position; secondly, by bandage. It will be manifest, that the leg is to be laid (in opposition to the general rule) extended; so that the lower portion of the patella may be raised on the fore part of the joint. The body must be brought forward in the sitting posture, that the point of origin of the rectus from the pelvis, may incline towards the knee, and relax the quadriceps muscle. Or instead of the patient sitting in an uneasy posture, he may lie on either side, only having the hip joint bent, and the leg extended.

When the extensor muscles of the leg, which are inserted into the patella, are thus to the utmost degree relaxed, the pieces of the patella will have come into their natural position. A bandage must now be applied to guard them against



the accident of an unwary movement, producing action in the muscles of the thigh.

A long double neckcloth is twisted together, then laid over the knee above the upper portion of the patella; it hangs down on either side; take hold of the hanging parts of the cloth, and with the fore finger of the left hand, hook that which is held by the right, and with the fore finger of the right hand hook the cloth where it is held by the left, so as to bring them across under the knee: then bring the ends of the cloth over the lower part of the joint, and below the inferior portion of the patella, and pass them through their respective nooses, formed as described by the fore fingers, draw the whole tight, and then approximate the two circular turns of the bandage, which are above and below the knee pan, by finally passing the ends through the upper circular, and fixing them there.

We have now to inquire why there is so remarkable a lameness after the fracture of the patella, and why the patella of the other side is so apt to be fractured in a person who has once met with the accident.

The second accident follows naturally from the lameness consequent on the first; and this lameness, which is so frequent a consequence of the fractured patella, proceeds from two circumstances. 1. The fractured pieces are not brought into accurate correspondence; but owing to the imperfect relaxation of the quadriceps muscle, the upper portion is kept too high to be in contact with the lower, and instead of bone uniting the two parts of the patella, there is a long intermediate ligament, (such as I have represented in the annexed plate). One consequence of this is, that the muscles being allowed to remain contracted, they lose their power of giving a perpetual tension and support to the limb, and also of accommodating themselves readily, and with sufficient strength to the necessary motions. 2. The patella, in its natural position on the top of the knee, being somewhat removed from the centre of the joint, bestows a power on the muscles, by extending the lever on which they act; but when, instead of

the bone, the new-formed tendon runs over the articulating head of the thigh bone, this lever is lost. It is possible to make a perfect recovery, in cases of broken patella, by producing a close union betwixt the broken pieces in the way that I have described.

If unfortunately the patella should be united by a long intervening ligament, we need not despair of bringing the muscles to accommodate themselves to this lengthening of their tendon. Often, though the thigh bone be remarkably shortened after fracture, yet the muscular action of the limb is by exercise restored to full power. So in this instance, by exercise, the shortened muscles become capable of still further contraction. To facilitate this, Mr. Hunter recommended that the patient should seat himself on a table, and by giving motion to the leg, exercise these muscles, and that he ought to put a weight on the foot, to be increased as the power of the limb was regained.

When the patella is fractured by a blow, as I have seen it by the kick of a horse, the connexions of the muscles with the joint, independent of the patella, keep it from being drawn up, as in the fracture I have already described. Here the injury to the joint is so great, that we cannot apply a bandage if it were required. We trust to the position alone, and are careful to bleed largely, and apply cold cloths so as to keep off inflammation.

I have seen a very terrible accident follow the imperfect cure of the fractured patella. The bone had united by ligament, and this ligament had incorporated with the skin in such a manner that it lost much of its pliancy. The poor man was carrying a burden and fell backward, the knee sunk under him, and the whole fore part of the joint was laid open by laceration. The case terminated in amputation of the limb.



FRACTURE OF THE FIBULA.

IN this sketch we may discover the nature of the case of fractured fibula. In the first place, it brings to our recollection that the fibula does not support the weight of the body, and that it will never be broken by the shock of the body on the leg, unless the tibia first gives way. But remembering the constitution of the ankle joint, and that the fibula reaches down upon the outside of that joint, it is pretty evident that the fibula can be broken only by a force directly applied to it, or by a twist of the foot. The first example, is when a man falls, and the side of the fibula strikes a stone, over which it is broken; or when he receives a blow on it; or when his leg is pressed betwixt his horse's side and the ground: this is the simplest case. On the contrary, the fibula fractured in consequence of the foot being wrenched on an uneven pavement, is bad, because it is complicated with a strain, if not absolutely a dislocation of the ankle joint.

When the heel only touches the ground, and the balance of the foot is not preserved by the resistance of the ball of the

great toe, as the heel bone does not stand perpendicularly under the tibia, the end of the tibia, which forms the *malleolus internus*, bursts, or at least strains the deltoid ligament, which unites it to the astragalus. Then the point of the fibula, B, forming the *malleolus externus*, preserves the joint; or if the violence be great, it falls on this small bone in the direction of the dotted line, C, C; so that it yields and breaks a few inches above the ankle, as at D. It follows from this, that when we find a patient complaining of a strain of the inner ankle, we examine the fibula, &c. if in any other instance we see plainly that the fibula is broken, we are careful to examine the inner ankle knowing that it must have suffered in some degree, though there may not be a subluxation.

A splint, which will reach from the knee along the outside of the foot is prepared. In the hollow of the splint, soft lint is placed, so that it equally supports the limb, an eighteen-tailed bandage is put under the splint; and this apparatus is so placed on the mattress, that the patient's leg being laid upon it, rests on the outside of the leg and foot. Having laid down the leg on the splint, we examine again the degree of prominence of the inner ankle, and see that there is no twist or obliquity of the foot. We are careful to notice, that the lower head of the fibula, and the side of the foot, are equally supported; that the side of the foot is neither allowed to hang over the end of the splint, nor too much pressed up; the bandage is then applied. From time to time we must examine, lest the integuments of the inner ankle indicate too great a degree prominence in the tibia; and also to see that the heads of the fibula, on which the limb now lies, are not suffering by the pressure.

#### OF THE FRACTURE OF THE TIBIA.

THERE is no difficulty in ascertaining the nature of the case, when the tibia is fractured.

The splints to be applied are, first, one strong splint of wood and leather, or of tin, which is to reach from the out-



side of the knee to the side of the foot. It must be made to receive the upper and lower heads of the fibula, and hollowed to receive the prominent muscles of the outside of the leg. Another splint, shorter than the last, is to be adapted to the plane surface of the tibia, on the inside. This splint should be straight, and reach only to the heads of the tibia.

The fracture of the tibia is often of the worst kind. The tibia is weak, when we consider that the bone of one leg only, often sustains the whole weight and shock of the body.

Like the thigh bone, it is often broken obliquely, because it receives the shock of the body perpendicularly on its shaft ; but a worse circumstance in the state of this bone is, that it is covered only by the thin integuments. These together, are the causes of the compound fracture of the tibia being so very frequent. They explain too, how a compound fracture, of any other bones, which are deeply imbedded in the soft parts, can be with so much more ease converted into simple fracture, than that of the tibia, viz. because the bones can be withdrawn from the wound, and the integuments healed so much more easily.

In the treatment of the fracture of the bones of the leg, there is only one thing more to be noticed in the way of a leading principle. I allude to the strength of the muscles of the leg, (muscles sufficiently strong to raise the weight of the whole body) being on the back part only ; and that immediately on the accident, they are apt to cause the two pieces of bone to stand at such an angle as to thrust the broken ends through the integuments.

When during the cure, the broken ends of the tibia are made to project more and more at the shin, it is to be attributed to the action of these muscles : and I conceive the best way of counteracting this, is to turn the limb, so that the heel may rest on the bed, while the toes are extended. This fully relaxes the muscles, while it gives the weight of the limb to counteract the curvature which is taking place. If the foot rests so that the toes are perpendicular to the heel,

then there is a stress upon the muscles of the leg ; because the Achillis tendon is stretched.

When the heel is made to rest on the bed, care must be taken that the foot do not fall outward, else the tibia will be twisted, and there will be an irregular prominence of the broken bone, on the inside of the shin.

## OF THE PERIOD OF CONFINEMENT.

THE last observation I shall make, regarding fracture of the limbs, relates to the length of time which is necessary to the complete union of the bones. Different periods are prescribed to us before it shall be permitted that the patient should rise and use his limbs. Yet as far as I have been able to judge, the period of confinement ought not to be determined, on the idea that there is any distinction in the commencement or termination of the process of ossification in the smaller and in the larger bone. The arm bone will unite as soon as the clavicle ; and if the derangement of the surrounding parts, in the case of fractured thigh bone, be not much greater than in the fractured arm bone, the greater bone will be united as soon as the lesser. But in giving liberty to the patient, we should have regard to the use of the limb, and the stress to which the bone is to be exposed. And then, indeed, a proper difference arises between the bones of the arm, and those of the lower extremity ; in the former, the bone bearing the weight of the limb only ; in the latter, the bone sustaining the weight of the whole body and limb.

The bandage around the fractured clavicle, may be eased before the expiration of the month ; but the arm ought not to be moved till the end of the month.

Indeed the fractured humerus is not secure before the end of six weeks ; and the same time is required for the bones of the fore arm.

But we cannot allow the patient who has had a broken thigh bone, to rise till after the six weeks ; and then he is

not to risk the weight of the body on the limb, but the limb is to be lifted and carried ; so in fracture of the tibia, the confinement, or at least the precaution against resting on the limb, must be continued as long as in the instance of fractured thigh bone.

A difference may be observed in the time of the knitting of the fractured bones, ascribable to the state of the patient's health, and of course this will depend on air, diet, and constitution.

When there is pain in the attempt to use the limb, it indicates, that the inflammation has not subsided, or that the natural action is not yet established. It ought, therefore, to make us cautious of using the limb.

#### OF FRACTURES OF THE RIBS, STERNUM, AND PELVIS.

THE cases of fractured ribs, sternum, or pelvis, form a distinct class, because they resemble injuries of the skull more than the fracture of the bones of the extremity, in this, that they are dangerous only in so far as they do mischief to the contained viscera.

#### OF A FRACTURED RIB.

THE principal security of the bones of the chest is their elasticity. While the perfect elasticity of the cartilaginous joinings of the ribs remains, they are much protected, because they yield, and by that means are saved from shocks which would break them ; therefore, men are more liable to have fractured ribs in mature years.

The ribs are often fractured by the person falling on a projecting corner, as of a table or chair. If he be reaching to take down something above him, and, stepping on a chair, he falls and strikes his side upon the corner of the chair, he will probably break his ribs. But I have had strong grounds of suspicion that patients have been braced up for weeks without any necessity, and that both surgeon and pa-

tient have mistaken the pain of the bruised muscles, which lie on the side of the chest for the effect of fractured bone.

To find whether the rib be broken or not, we must feel along its whole course: but if there be a particular spot very painful, and yet we do not distinguish the fracture, we must press in the rib at a part remote from this; when, if it be fractured, it will yield, and produce the same pain as before; but if the bone be entire, there will be no pain, because the bruised integuments are not affected by the pressure. When the patient insists that there is something particularly wrong, because he finds a sharp pain when he moves, it should still be considered whether this be not owing to the bruised flesh of the *descendens abdominis* or *serratus magnus*. You make him breathe, and there is no pain nor crepitation while you place the fingers on the part; you make him exert those muscles while the breathing is suspended, and then he feels the sharp pain caused by the action of the bruised muscles.

When a rib is broken, we have only to keep it from moving by preventing the motion of the chest in respiration; for it is unnecessary to attempt to keep the rib in its place, this being already accomplished by the neighbouring ribs, and by the connexion of the rib with the intercostal muscles. It is to be remarked, that the lower ribs have so free a motion, and so much elasticity, that they are not apt to be broken; while the upper one is defended by the clavicle.

If a fractured rib be neglected, there is much pain, and much danger of inflammation in the chest, and, in the end, of caries of the rib; for, by the motion of respiration, there is an incessant rubbing and grating of the broken ends of the ribs which prevents their union.

I have dissected the body of a man who died in consequence of the fracture of two ribs; or rather, I ought to say, in consequence of their being neglected, the nature of the case having been misunderstood. There was an abscess under the pectoral muscle, and a caries of the ribs; and, from the irritation spreading within the chest, much matter had been formed in the cavity, and even the pericardium contained



pus. It will be said, that this extensive mischief could not have proceeded from the fracture of two ribs had not the constitution been bad. This may be true, but from this we can only infer, that we should be more careful of such accidents where there is constitutional weakness.

The mention of this terrible consequence of neglected fracture, reminds me of the necessity of cautioning my reader against the consequence of a mere BRUISE OF THE CHEST. For, if abscess form under the broad muscles of the side, carries of the bones and abscess within, may be the consequence. It becomes our duty, therefore, to take precautions that matter do not collect under the pectoralis major or serratus muscles, and still more, that disease of the sternum does not follow contusion of that bone.

A compound fracture of the ribs will not readily happen in consequence of the ribs projecting, for the ribs are, in truth, beaten in when fractured. But owing to this latter circumstance, the fracture of the rib is often complicated with a puncture of the lungs, or the rupture of the intercostal artery.

If the lungs be wounded by the end of the ribs, we know it from the frothy blood spit up. If a man dies from the ribs being beaten in upon the lungs, after surviving the immediate effect of the accident, the chest of that side is found full of bloody serum, and the lungs are compressed.

When one or more of the ribs are fractured, a broad roller is put about the chest, and a split cloth is laid over the shoulders, to the ends of which the roller is pinned. This bandaging forces the patient to breathe by the diaphragm and muscles of the belly, while the chest is relieved from motion. The patient is then to be bled and put to bed. Bleeding, in this case, not only prevents the membranes of the chest from inflaming, but, by diminishing the quantity of circulating blood, it relieves the respiration, because the extent and frequency of the distension of the lungs is proportioned to the quantity and velocity of the circulating blood. If there be a tickling cough, after the bleeding, opiates may be given.

If, after the patient is put to bed, there should come on a difficulty of breathing, with oppression in the chest, the end of the rib has probably pierced the pleura and penetrated the lungs, and the cavity of the chest contains air which has escaped from the lungs. If a tumour on the broken rib succeeds to this, which crackles under the finger, it is the emphysematous tumour, so peculiarly characteristic of this accident. The air has been forced from the cavity of the chest into the cellular membrane by the compression of the chest, and it may be forced from the cellular membrane, which covers the wounded rib, over the whole body, until it closes the eyelids and distends the scrotum and integuments of the penis!

When the tumour merely betrays its nature, without much inconvenience, we need not mind it; but if it increases rapidly, and is attended with much oppression, punctures must be made in it with the lancet and the air pressed out, that both the cellular membrane may be freed from air, and the breathing from great oppression.

While, in consequence of the accidental puncture of the lungs by the rib, the air distends the cavity and compresses the lungs on one side, the breathing and circulation may be oppressed and difficult; but still there is no interruption of the function of respiration: at last, however, by the great distension of one side, the mediastinum suffers, and the cavity of the other side is encroached upon; and both the diaphragm and the external muscles of respiration are impeded in their action. There is a sympathy which pervades all the muscles of respiration, and even if the cavity of one side be distended, the muscles of that side cannot act, and their impeded action prevents the free motion of those of the other side. Therefore it is that in emphysema there is, in the end, great anxiety and oppression, and the heart partaking of the influence, there is a feeble pulse and cold extremities.

When the emphysema has proved the nature of the case, and the symptoms are thus pressing, we have to make an incision through the integuments and intercostal muscle, and

then puncture the pleura; by this means, the lungs of the wounded side will not be restored, but the play of the chest will become free, and the lungs of the other side will resume their action.

When a rib is fractured, the intercostal artery may be torn; and should it happen that the artery is opened, and yet not torn across, it will bleed until the lungs are oppressed. Then with the common marks of hæmorrhagy, the patient finds himself greatly oppressed. He has a sense of suffocation, and cannot lie down; and he breathes with contortion of the body, to allow the side of the chest opposite to that which contains the accumulated blood, to expand in respiration. It is, in this case, the business of the surgeon to make an incision on the lower edge of the rib fractured, and a little further back than the broken point of the rib, taking care not to cut the artery which lies just under the rib; and, having cut through the integuments and intercostal muscles, he ought to puncture the pleura. If he finds coagulated blood, he will be tempted to enlarge the wound, and introduce his finger to give vent to the blood and coagulum. If, after this, the blood accumulate again, it must be again evacuated, and a compress of sponge put into the wound, so as to press the artery against the rib. Should there be bloody froth discharged from the mouth, the lungs are wounded, and then probably emphysema will unequivocally betray the nature of the case.

## FRACTURE OF THE STERNUM.

THE fracture of the sternum is a very alarming accident, both from the parts contained under it, and from the spongy nature of the bone. Like the ribs, during respiration, the sternum is in incessant motion; and the thorax being of a conical form, and the lower part admitting of a much greater extent of motion than the upper part, it follows, that when the sternum is fractured across, there is a perpetual grating of the broken parts of the bone; the lower part of

the sternum, being attached to the longer ribs, moves through a larger space than the upper portion. This rubbing and grating of the fractured bones will produce inflammation and suppuration under the bone, viz. in the interior mediastinum.

The danger from the mere motion of ordinary respiration is, of course, much increased when the almost inevitable consequences of the accident supervene—irritation and inflammation in the chest, and a troublesome cough.

From these considerations it will be understood how the patient, having happily escaped the immediate shock and injury to the thoracic viscera, is in danger of caries of the bone, and abscess under it; and it will be seen too, that the swathing, or bandaging of the chest is equally necessary here as in the fracture of the ribs, and that bleeding must be oftener repeated, and every possible cause of irritation avoided.

It may happen that we require to draw out and pick away broken pieces of the sternum; but fracture of the sternum, I am inclined to hope, does not ever require the trephine. We have however observed that the sternum is a very spongy bone, and therefore a part that is not always secure from scrophulous action when it is bruised. The caries of the sternum does, in some measure, hold analogy with the caries of the skull: it is the communication of the disease to the contained parts which we have to dread in both; and here it may be necessary, in some cases to apply the trephine to allow the free discharge of matter, or to take away a dead piece of bone which is the source of irritation.

#### FRACTURE OF THE BONES OF THE FACE.

THE lower jaw bone, being much exposed and moveable, is very often fractured. It is fractured by blows and falls, and is often found to be broken in two places. The reason of this complicated fracture we may see in the arched form of the bone, and the support it has at the condyles; for it



is impossible that one side of the bone should be beat in, without some other part of the arch suffering, at the same time, in nearly an equal degree with the part which is struck.

I cannot conceive how a difficulty can arise in ascertaining the nature of the case when the jaw bone is fractured ; yet I have had occasion to set it after an eminent surgeon had dressed all the other hurts, but taken no notice of this—and authors insist on the marks of fracture as of the first importance. To examine the jaw bone, we place the fingers of the left hand on the angles of the bone, and then take hold of the alveolar part of the jaw bone in front, and endeavour to move it laterally. We in the mean while, keep the eye on the teeth, when we shall easily discover whether there has been any fracture of the lateral part of the bone : or we feel and press along the base of the jaw. In boys there is sometimes a splitting of the lower jaw at the symphysis which is not so readily ascertained. The patient has perhaps fallen from a height ; he has lost one or two of the front teeth, or they are loose, and a greater space than natural is betwixt them : By taking hold of the alveolar part of the jaw, with the finger and thumb on each side of the symphysis, the fracture is at once ascertained by the usual symptoms.

If a boy has split the symphysis of the lower jaw, we replace the teeth, and then bring the sides of the jaw together. We then take a bandage with four tails, and cut a hole in the centre of it, which will just admit the chin. The centre of the bandage being placed over the chin, the two upper tails are brought round the back of the head, and the two lower tails are carried over the vertex. I have found this quite sufficient to keep the jaw bone and teeth in accurate contact. The bandage may be made more secure by covering that part of it which embraces the face with an adhesive plaster. If it be thought necessary to tie the teeth together, the whole of the front teeth ought to be included in a cord of silk ; but this cannot be done, if the teeth have been shaken and are loose.

In the case of fracture of the base of the jaw, and especially if there be a fracture of both sides, it is more difficult to keep the pieces in their place. This is owing to the same circumstance that disorders all other fractured bones, viz. the unequal action of the muscles. We may recollect that the muscles which close the lower jaw are powerful, and are fixed into the coronoid process, or the angle of the jaw. The muscles which draw down the jaw are weak, but inserted into the bone more forward, so that they operate with a longer lever. These different insertions of the two classes of muscles cause a distortion of the jaw bone, when it is broken as we have described; for then the back part of the bone is held firmly up, while the fore part is pulled down by the muscles of the throat and the digastricus.

If the teeth be very regular, and those of the upper and lower jaw correspond, those of the upper jaw serve the purpose of secure splints, when the base of the jaw and chin are bandaged. If the patient has lost a tooth previously, and when the pieces of the broken jaw are brought together, there is a deficiency or inequality in the teeth, then a piece of cork may be adapted to the teeth of each side in such a manner as to serve the purpose of a splint. The chin being brought up, and the hindmost pieces of the bone pushed back so that there is an adjustment, the jaw is to be secured on the outside. A piece of pasteboard is to be cut into such a shape as may be accommodated to the chin and jaw: It is to be notched round the edge, and then moistened, that being applied on the lower part of the chin it may be brought up on the base and sides of the jaw on both sides. Over it is to be applied the four-headed roller as already described.

There can be no occasion, in this case, for feeding the patient with a pipe, or attempting to nourish him with clysters. Perhaps he may fortunately on this occasion have lost one of his teeth, and through the interstice he can suck his nourishment.

But if the teeth be altogether perfect, in that case, rather than that he should have to live altogether on liquids, the

cork splints may be laid along the teeth, which, while they give firmness to the bandaging, allow an interstice in front for giving food.

## FRACTURE OF THE BONES OF THE NOSE.

No doubt the ossa nasi suffer fracture, but they are oftener in a manner dislocated, that is to say, one of them is beat in, while the other lies over it. When they are fractured and entirely beat down, the shock sometimes reaches the septum nasi, and it is also fractured. Nay, a worse effect may yet be a consequence of a blow on the nose. It has happened that the delicate cribriform plate of the ethmoid bone has been fractured and pushed up on the brain, from the shock communicated to it through the septum !

The arch of the nose is to be raised by a strong probe covered with lint : by putting oil on the little finger, we may push it into the nostril, so as to replace the cartilage and bone of the septum ; tubes of any kind, I believe cannot be introduced so as to support the broken bones. When the bones are replaced they will not readily move from their place ; there are no muscles, no motion of the part to change their position, and very soon a swelling of the nose and membranes comes on which supports them sufficiently.

If, in consequence of a blow on the nose, and a fracture of the ethmoid bone, there should succeed discharge of matter with symptoms of a beginning affection of the brain, then ought we to probe gently and perhaps pull upon the perpendicular plate of the ethmoid bone, that we may bring down any part of the horizontal plate which may be irritating the brain. In the mean time, by every means in our power, we ward off inflammation. Happily the case is not likely to occur.

## CHAPTER VIII.

## OF DISLOCATION.

**L**UXATION or DISLOCATION is the displacement of the articulating surfaces of the bones. Dislocation is the consequence of a twist of the limb not the effect of direct injury to the joint which is deranged. Mistakes both in the diagnosis and in the efforts to reduce the bones, will arise from overlooking this very obvious fact. There is a division of dislocation into kinds. DISLOCATION implies that the articulating surfaces of the bones no longer correspond in any degree, that the bone is entirely displaced ; as when the head of the humerus lies in the axilla, or the head of the femur has been forced from the acetabulum, and lies on the back of the ilium. SUBLUXATION is the derangement of the articulating heads of the bones, while yet they are in contact and rest against each other. The entanglement of the articulating processes of the vertebræ of the loins is a subluxation : there may be a subluxation of the knee, or more frequently of the ankle joint.

Then we have the distinction of simple and compound dislocation, analogous to that of simple and compound fracture. In compound dislocation there is a wound of the integuments with dislocation of the bone ; and it is dangerous, as there is united an inflamed and suppurating wound of the soft parts with the wound of a joint, which consists of parts widely differing in economy, parts slow to inflame, but of which the inflammation when excited is violent in degree.

*Diastasis* is a mere separation of the bones.

There is yet another distinction, viz. into old and recent dislocation. This is a distinction sometimes important to the



surgeon, for he has to consider the consequences of the bones remaining long displaced before he determines on attempting to reduce the dislocation.

I need not remind my readers of the nature of the ligaments and cellular substance. The ligaments are dense, white, strong, and possessed of little vascularity; they are of two kinds; first, such as are weak, but destined to preserve the sinovia, and to separate the articulating surfaces from the surrounding parts; these capsules are very weak. The second kind possess no elasticity, pass from point to point of adjoining bones, and are the strength of the articulation. Perhaps with these may be classed such tendons of muscles as surround the joint, and are incorporated with the capsular ligament. Now it is possible, that one side of a joint only is sprained, the stronger uniting ligaments are partially lacerated, and there is a weakness and yielding of the joint, or there is, perhaps, a subluxation. But when there is a dislocation, and actual displacement of the bones, both the capsular and uniting ligaments must be torn; sometimes in the whole circle of the bones, always for more than one half the circumference of the head of the bone. From this it follows, that there cannot be a noosing of the head of the dislocated bone in the slit of the capsule, as some have imagined to be the case, when the reduction has proved difficult. (See further under the head of Dislocated Shoulder.)

In dislocation, then, the head of the displaced bone lies among the cellular membrane, and is either lodged betwixt the muscles, or presses upon a bone. Where the smooth articulating cartilage is in contact with the cellular membrane, it presses and condenses the cellular membrane so that it becomes a substitution for the natural capsule, while the torn capsules and ligaments adhere to the surrounding parts. If the head of the dislocated bone presses on a flat bone, as the os innominatum, or scapula, an imperfect articulating surface is at last formed. In the mean time, the head of the bone no longer resting in the natural cavity, the surrounding soft parts encroach upon the cavity, and adhesions form a parti-

tion betwixt the head of the bone and its former place. Besides, there is another unfavourable circumstance, the muscles adapt themselves to the state of the bones, and are permanently shortened, so that they strongly resist the reduction.

The meaning of the distinction into recent and old dislocation will now be understood. When the dislocation is of long standing, the new adhesions are to be torn up, and violence must be done to the limb, as great, perhaps, as that which caused the displacement of the bone, before it can be reduced : while in a recent dislocation there is no obstruction to the reduction but in the muscles, or natural ligaments.

In speaking of the degrees of derangement of the joint from violence, it is proper to mention sprains, and to explain that degree of weakness which remains after them.

A sprain is a momentary derangement of the articulating surfaces of bones, by which a stress is put on the ligaments, and those of one side are either partially torn, or they are stretched so that they inflame. In every sense of the word I deny that the capsules and ligaments of a joint are insensible—sensibility to pain is the grand safeguard to the body ; and, although the joints do not feel in the same manner and degree with the skin and superficial parts, yet they have that degree of sensibility which suits their condition ; is there not excruciating pain when a man sprains his ankle ? and yet the pain is not in the skin, it is quite different from the shock of a superficial part ; and except the skin, there is nothing to suffer pain but tendons, and sheaths, and ligaments, which physiologists say are insensible. Physiologists have erred because they have not perceived the end of this sensibility, and the variety in kind, as well as in degree, which is suited to the functions of the several parts. If the end of a bone, and the capsule, were sensible as the skin or eye, or other delicate organ, their common and necessary function would lay the foundation of inflammation, a greater degree of sensibility would be the consequence, and the evil would increase until the mobility of the joint were destroyed. In the common and necessary motion of the joints there is no sensation, no injury

from the friction of the parts. But, if in the violent and irregular motions of the joints there should be no sensation communicated, then would there be an absence of the governing principle, and no restraint, and no means of renovation. We may see now, why, in experiments on the tendons and ligaments by pouring acids upon them, and pricking them with needles, the animal gives no sign of pain; and yet in sprains, and dislocations there is extreme torture;—we wonder only that the distinction should have been overlooked.

To preserve the natural state of a joint that inferior degree of activity of vessels only is necessary, which, perhaps erroneously, we call a weak action.

However, it is important to observe, that whenever this natural state of action is changed, there is also a change in the nature of the part. The pain I have described is followed by its usual effect, inflammation: the ligaments when inflamed lose their density and firmness, they swell, become weak, and acquire a new kind of sensibility, and no longer bind the bones with their former strength. This is the explanation of the weakness of a joint after a dislocation, or a sprain: without this increased activity of vessels there could be no regeneration of the ruptured parts; injury to a joint would be like the breaking of the parts of a machine which possess no property of restoring themselves. Nothing, however, is more difficult, than to change this low degree of continued inflammation, and to restore the state of the parts to their natural density and firmness. In the scrophulous constitution there is, unfortunately, a tendency to this inflammatory action in the joints, which it is very difficult to allay. It is not bleeding and purging which will reach a local disease of this kind; far less will this do good if there be any constitutional tendency to scrophulous actions. We may take a hint from quacks and bone-setters; I have known them remarkably successful by employing severe and continued irritation on the surface while they have forcibly moved the stiff and pained joint. But this has been after the surgeon has exhausted the patient.



by ineffectual applications, or, in other words, after all active inflammation has subsided.

To ascertain the nature of the accident when we have reason to think there is dislocation, we must consider these points :

1. We, perhaps, find the joint much discoloured, and marks of a blow received upon it. This implies, though it be no absolute proof, that the bones are not dislocated, but only the joint bruised ; because, as I have said, it is the long lever of the bones receiving the force upon the extremity distant from the joint, which does violence to the connecting ligaments. For example, if there has not been a blow on the shoulder, but the patient falling on the wrist, has pain and lameness of the shoulder joint, then sprain or dislocation of the shoulder is the probable cause of the pain and incapacity ; if, on the contrary, there shall be evident marks of a bruise on the shoulder, it is probably not a dislocation.

2. The knowledge of the natural form and position of the limb will often enable us with a glance of the eye, to discover the distortion caused by dislocation. Generally the limb is shorter, though sometimes it is lengthened ; when with this there is joined a stiff and awkward position, from which the limb is not moved without great pain, and when, upon examining it more particularly, there is a rigidity of one set of muscles, the dislocation is ascertained. We consider the new position of the head of the bone ; the effect of this change, on the muscles inserted into it ; we feel those muscles, and they are rigid like cords ; and this, with the circumstance of the accident having produced this immediate consequence, is decisive of the nature of the case. There may occur a contraction and stiffness of the muscles from spasm, producing a resemblance to the unnatural position of the dislocated limb, but there will not be the actual distortion proceeding from the new position of the bone, and the change in the angle of insertion of the muscle ; there will be no shortening of the limb. In dislocation, the motion which is allowed to the limb is often interrupted and unequal. There is also a particular checking occasioned by the head of the bone strik-



ing against a flat surface, not rolling in its natural socket. But let us recollect, that there may be a roughness and impeded motion in the joint, occasioned by inflammation having diminished the natural secretion of sinovia, where there is no degree of dislocation.

Another diagnostic may be sometimes found in the pressure of the displaced head of the bone.—I not only mean that we may sometimes discover the displaced head of the bone, but that the effect of its pressure on the neighbouring parts declares to us its new position: as for example, when the head of the humerus, resting in the axilla, presses on the nerves, or artery, or causes numbness of the hand and arm, or weakness in the pulse at the wrist.

Before we attempt to reduce a dislocation it behoves us, in a particular manner, to think of the position in which the patient stood, and the nature of the force which displaced the bone. It must be very evident, that the bone ought to be brought to the same position in which it received the impulse which dislocated it, before it can be easily reduced. We shall find examples as we proceed, where the ligaments impede the reduction, owing to the neglect of this plain rule.

The muscles too will always, in a certain degree, impede the reduction. On attending to the origins and insertions, or, in other words, to the action of the muscles, it is possible, by bending the joints, and relaxing the flexor muscles, to free the head of the bone from its confinement. It is a commonly received opinion, that the action of the muscles is not always direct against the elongation of the limb, but that they bind the heads of the dislocated bones together, so that the processes of the bones check into each other, and absolutely prevent any degree of direct force from disentangling these processes, or stretching the limb.

Next in importance to the relaxation of the muscles, and the due direction of the shaft of the dislocated bone, is the providing of proper laques; but especially applying them well, and to their proper place. The two bones, whose surfaces are dislocated, must, if possible, receive the whole force.

To reduce the shoulder joint, the chief difficulty is to secure the scapula; and the efforts to reduce the dislocated thigh bone are often ineffectual owing to the pelvis being left free, and only the other thigh secured.

It is customary, and right, to fatigue the muscles of the limb before the full effort is made to reduce the bone. The tackle is pulled tight, and the force gradually increased; the surgeon feels the progress of the head of the bone, and directs the efforts of the assistants; and by rolling the head of the bone, and sometimes by lateral pressure, (such as may serve to disentangle the processes of bones), he assists their efforts: or, when the bones have been brought as near to a correspondence as the direct pulling on the limb will affect, by a sudden effort he changes the angle of the joint, and with the power of the long bone, as a lever, reduces the dislocation.

The marks of the reduction may be learned from what I have said of the signs of dislocation; or they may be summed up by saying that the limb is brought to its natural state, and the patient suddenly gains the power of complete motion. The bone will often return with a distinct and audible jirk into its place, such as might be expected from the smooth round head of the bone being drawn over the margin into the well-lubricated hollow of the socket. The freedom from the painful and unequal extension of the muscles, makes the patient satisfied that the bone is reduced, before the surgeon can be aware of it.

The mechanical power of the double pulley ought to be preferred to the force of many assistants, from its being so much more easily managed and directed. But let it be remembered, that the surgeon may make a miscalculation of this mechanical increase of power very hurtful to the patient.

## DISLOCATION OF THE CLAVICLE.

ALTHOUGH the clavicle be united to the sternum by strong ligaments, yet it is a weak joint, seeing that it is small to bear the weight, and allow the free motion of the upper ex-

tremity. In truth it is the weakness of the bone more than the strength of the joint that prevents the dislocation of the clavicle at the nearer extremity. When the clavicle is dislocated from the sternum the nature of the accident cannot be mistaken. The intention in the treatment is also sufficiently evident.

The shoulder is to be bound moderately back, and the arm slung, whilst a compress is to be put on the clavicle, and the roller brought round from under the arm pit of that side obliquely across the shoulder and side of the neck, in order to press down the end of the clavicle into its place.

The clavicle is sometimes dislocated from its connexion with the acromion scapulæ. This dislocation may at first sight be mistaken for a dislocated humerus, until the nature of the injury being understood, we find that the force used has not been such as is likely to turn out the humerus from its place. And although there appears to be at first that hollow under the projection of the shoulder which implies the dislodgement of the head of the humerus from its place, yet presently we discover that this is only occasioned by the comparative projection of the scapular end of the clavicle; or rather more strictly speaking, that the shoulder has fallen nearer to the breast, while the clavicle is left with its further extremity projecting; we find that the humerus admits of easy and uninterrupted motion.

I have said that the clavicle projects, yet properly this is rather the receding of the scapula and humerus, which are now no longer kept off the breast by the clavicle. With more propriety therefore in this instance, we should term the accident the dislocation of the scapula than of the clavicle, as the clavicle remains in its place. The operation is to replace the scapula: this is to be done by holding the arm and scapula in due relation to the clavicle until the spica bandage be applied over the shoulder joint. When we suspend the fore arm, and put a pad in the arm pit to keep the scapula at its proper distance from the sternum.

## DISLOCATION OF THE HEAD OF THE HUMERUS.

It is not in general a shock communicated to the joint which dislocates the humerus from the scapula, but a twist of the arm. If, for example, a boy stand holding a horse by the bridle, and the horse tosses his head, then the boy's arm is raised, and the head of the humerus is displaced from the glenoid cavity of the scapula. Or again, if a man slip his foot and fall, and if to save himself he stretches out the arm, then the full weight of the body being sustained by the hand, and operating with the advantage of the long lever of the arm, it turns the head of the humerus off the articulating surface of the scapula.

It will be remembered, that the very free motion of the scapula is the safe-guard of the shoulder joint; for the scapula following the motions of the arm prevents the arm bone from rising to an angle with the glenoid surface, which would in a manner facilitate dislocation. This gliding motion of the scapula keeps the humerus, even in its highest elevation, still perpendicular to the glenoid cavity.



Still the position of the arm favourable to dislocation is when the arm bone is raised to its utmost limits, and until it be checked by the acromion process of the scapula. The



Bones then stand in the relation to each other that is here represented. A is the scapula. B the acromion scapulæ. C the humerus: while D may represent the lower part of the capsule. If the arm be thus raised, and there is a force suddenly raising the arm further, a spasmodic action of the muscles inserted into the scapula fix it, and then the arm bone, C, comes in contact with the process, B, as here represented, and the force operating on the long lever of the arm, the head of the bone bursts through the capsule, D; tears the ligaments of the joint, and lodges in the axilla. Indeed, as to the place of the head of the humerus in dislocation it depends on the direction of the force combined with the operation of the muscles. If, for example, while the humerus is made to act like a lever, tearing up the ligaments of the joint, it at the same time receives an impulse in the line E D; that is in the direction of the shaft of the bone, then will the head be urged deep into the axilla, or under the pectoralis major muscle.



A, The scapula, seen on the inside. B, An outline representing the humerus in its natural place. C, The humerus represented dislocated. D, The humerus in outline representing the consequence of pressing the elbow to the side, viz. that the head rises and presses against the neck of the scapula.

THE SIGNS OF DISLOCATION of the shoulder are these :—

1. There is a hollow in the middle of the deltoid muscle, and directly under the acromion process; because the head of the humerus is removed from the glenoid cavity of the scapula, and no longer serves to give roundness to the shoulder.

2. The head of the humerus is to be felt in the axilla.

3. The elbow cannot be pressed to the side without difficulty and pain. (This however is an indication which becomes less distinct in old cases.)

4. The patient cannot make the circular motion of the arm. He raises his hand to his head awkwardly, and with pain.

5. There is an unusual bend or depression near the middle of the arm, from the change in the angle of insertion of the deltoides in consequence of the new direction of the bone.

6. The fore arm is not freely extended, and there is a tenuity in the biceps muscle. This proceeds from the origin of the long head of the biceps retaining its hold on the edge of the glenoid cavity, while the tendon being engaged in the groove of the humerus must follow that bone, and consequently draw upon the belly of the muscle.

7. There is a numbness of the arm sometimes, and the pulse may be oppressed, or there may be oedema of the arm. This arises from the head of the humerus pressing on the axillary artery, or veins, or plexus of brachial nerves, and depends therefore on the accidental position of the head of the bone.

#### POSITION OF THE HEAD OF THE HUMERUS.

1. No force can be applied in a direction to dislocate the humerus, and push its head behind the scapula, for this very evident reason, that the chest prevents the necessary position of the humerus.

2. Neither can the arm bone be dislocated upwards, because of the protection afforded to the joint by the prominence of the acromion and coracoid process; but chiefly, I believe, this is to be taken into consideration that there can

be no twist given to the bone when the arm is by the side, consequently the ligaments are not burst up.

3. But the head of the bone may be lodged forward, that is, the arm may be bent backward, the ligaments burst up, and the force such as to direct the head of the humerus under the pectoral muscle.

4. Downward, or downward and forward, is the most common position of the head of the humerus when dislocated. The reason is already explained, viz. that the arm can be extended in the opposite direction, that is upward and outward, and in that direction there is no check to the motion of the humerus but in the processes of the scapula: which however, being unequal to resist the force of so long a lever as the arm, serve only to throw the head of the humerus off the articulating surface of the scapula, and to tear up the ligaments of the joints.

#### OF THE REDUCTION IN SIMPLE CASES.

WE shall not at present stop to consider whether there ought properly to be any distinction made in dislocation of the shoulder joint, but merely observe, that often a slight force by the hands of the operator is sufficient to reduce it. The cases of difficulty I hope shall presently be explained.

The patient is seated in a chair; a table-cloth is put under the arm-pit and round the chest, while the ends are tied to some secure post or bench; a hand-towel is then put over the shoulder so as to press the acromion and scapular end of the clavicle; the ends of this cloth are put round the larger table-cloth, where it crosses the back and breast; they are drawn tight there and secured.

Something in form of a noose is now put above the elbow joint, and perhaps a hand-towel is the best thing we can use. It is twisted like a rope, and then applied in the form of a sailor's knot, in such a manner, that the more the ends are



pulled the more securely it grasps the arm\*. It must take firm hold of the condyles of the humerus. An assistant standing a little above the level of the patient, takes hold of these laques, and pulls gently at first, increasing the force gradually to the utmost. When the arm of the patient is somewhat fatigued, the surgeon takes hold of the arm with the right hand, placing the palm of his left on the top of the patient's shoulder; he directs the dislocated bone into that line in which it was dislocated, i. e. elevated and a little backwards; and increasing the force, he brings the arm round until its direction is forward and upward, when the bone will be in general reduced. The reduction is known by the audible jerk which the bone makes; by the immediate ease of the patient, by the hollow under the acromion being filled up, and by the easy motion of the arm being restored. During this operation it may be useful to bend the elbow joint, and use the fore-arm like a lever to roll the humerus, which will in the first instance serve to disentangle the head of the bone from its new connexions, and in the course of its motion towards the glenoid cavity facilitate the tubercles passing the edge of the scapula.

When the humerus is drawn out to that degree that the head is nearly on a level with the glenoid cavity of the scapula, and yet it does not slip into its place, we must vary the position of the arm by drawing the arm more upward, or what is the same thing, by allowing the shoulder of the patient to drop more, and the upper part of the trunk to fall a little to the side.

Though I have found, that when the head of the humerus lodged against the margin of the glenoid cavity, that it was reduced by suddenly depressing the elbow, and lifting the head of the bone with my fore-arm, pressing upwards in the axilla, yet I can see strong objections to it; nay, often instead of facilitating the reduction, this position of the humerus

\* It is a knot formed by twisting the cloth into two nooses, through which the arm is put, and on drawing the ends we have the firmest hold possible.



downward directly opposes it. I shall first state the fact of the great difficulty which sometimes occurs to the reduction of the dislocated shoulder, and then explain it from the consideration of the anatomy.

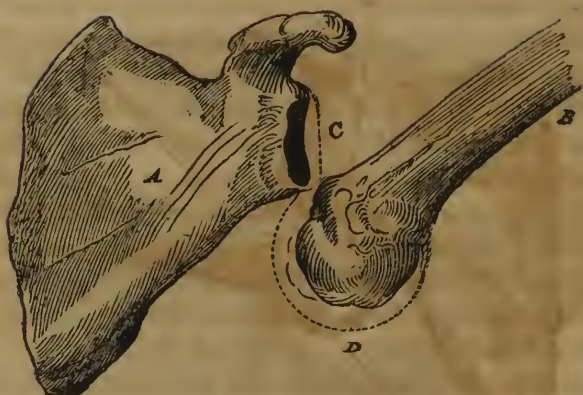
We are told that cases have occurred where no effort has succeeded in reducing the humerus, until by some unintentional motion, and by accident, the head of the bone has slipped into its place. What are we to think of this? not that the reduction is an *accident*, and that we are to move the arm in various directions until by a lucky chance the dislocation is reduced! A little further enquiry teaches us that there is a certain position in which the bone resists, and one also in which it as certainly yields. I have experienced this in the living body, and produced the same effect in the dead body. I have found that upon pulling the arm directly out from the body, horizontally, that not the smallest progress was made; but that at last the patient's body yielding somewhat, the effect was, that in relation to the scapula the position of the humerus was considerably raised, and that then the head of the bone slipped into its place.

The explanation which has been given of this accidental reduction is, that the head of the humerus when it was displaced burst through the capsular ligament without tearing it entirely away, and that the head of the bone was retained noosed in a slit of the capsule, so that it could not be reduced unless the arm was brought exactly to the position in which it was when displaced. To this it has been objected, that the head of the humerus does not merely burst through the capsule when dislocation takes place; the capsule is torn largely away from the edge of the glenoid cavity, so that the head of the bone cannot be retained in the slit of the capsule. It has been very resolutely affirmed, that the cause of this difficulty of reduction is to be found in the muscles: that the head of the bone when it burst from the capsule was pushed through betwixt the *teres major* and the *subscapularis* in this manner.



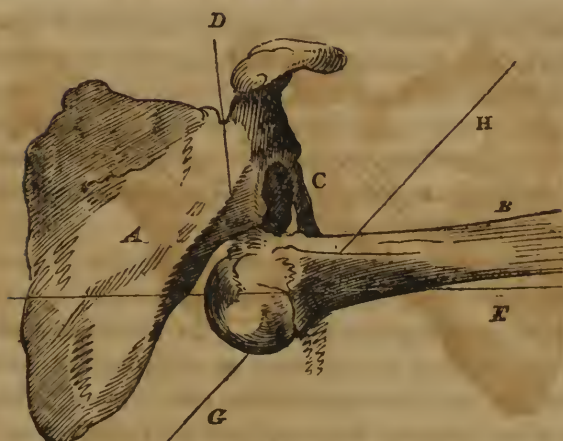
A, the clavicle. B, the scapula. C, the head of the humerus thrust betwixt the muscles. D, the subscapularis and teres minor. E, the teres major. F, is part of the latissimus dorsi. G, the deltoides. H, the coraco-brachialis. I, the biceps.

This sketch was taken from a dissection after an experiment on the dead body. It proved more than is shown here, for on pressing down the arm bone to the horizontal direction I found that the reduction was prevented, and keeping the parts in the exact position. I cut away all the muscles, and still the humerus was retained checked; but then what made the obstruction became apparent, viz. the upper part of the capsular ligament. But I must now explain in what manner the capsule is torn.



In this sketch the scapulá and humerus are represented in the relation to each other as if the humerus was just slipping from its position. Here it is evident, that as the line C, from the upper margin of the scapula to the nearest point of the attachment of the capsule to the humerus is shorter than the line D, which encircles the head of the bone, so will the side of the capsule which answers to C, be less stretched than the lower part at D, during dislocation. Indeed the upper part of the capsule of the joint is not more stretched when the humerus has slipped from the articulating surface of the scapula, than when the arm hangs naturally by the side. If in the dead body we cut the lower part of the capsule of the joint the humerus is easily dislocated, but if we cut the upper part only, and let the lower part of the capsule remain entire, it is very difficult to dislocate the bones, and not without tearing the lower part of the capsule.





In truth, when the humerus is dislocated this is the state of the bones and ligament. A, the scapula. B, the humerus dislocated. C, the capsule still entire on the upper part, though completely torn away on the lower and fore part. D, the rough protuberance of the head of the humerus checked under the neck of the scapula. And now it is evident, that when the arm is brought to the direction of the line E, the capsule C, resists the depression of the bone, and throws up the point D, under the neck of the scapula, and the greater the force employed to stretch the arm the firmer are the humerus and scapula tied together at the points C D. But if on the contrary we desist from this direction of the force horizontally, and raise the arm into the direction of the line G H, then the capsule C, is relaxed, and the point D, escapes from under the neck of the scapula and the bone is reduced.

In conclusion then, though by placing the fore arm in the axilla of the patient, and raising the head of the humerus while we depress the elbow, we facilitate the reduction when no part of the capsule remains, yet if there remains any shred of the capsule this manœuvre will directly impede the reduction. We must on the contrary elevate the elbow, or let the body of the patient fall somewhat more laterally, in order to facilitate the reduction.



There is no occasion for any bandage being used after reduction to keep the humerus in its place, that is effected by the bracing of the muscles round the joint. If any thing be required it is that some check may be given to the raising of the elbow too far from the side until the ligament has united. The surface may be rubbed with warm stimulating oils, and the arm gently and regularly moved.

In this violent operation one can imagine, that if the axillary artery were at all diseased it might be torn; but I have not known of such an accident, though I have known such an ecchymosis succeed the operation of reduction, as would imply the rupture of some considerable vein. In employing the ambe in the Newcastle Infirmary both the axillary artery and the muscle have been torn! so that they were obliged to amputate on the instant: one would expect that such a proof was not wanting to show that it was not the muscles but the *ligaments* which caused the very great difficulty in reducing the bone in dislocations.

Having proceeded thus far in what I had to say on the dislocation of the shoulder, I recollected that there was much ingenious observation in Mr. Hey's Surgery on this subject; I find too that there is much for animadversion. The student finds an example in that work under the head of Dislocation, of what most surgeons have experienced in their practice, a want of principle, and consequently a want of method.

In the three first cases we have an example of the easy reduction where the bone, we might almost say spontaneously, falls into its place. The conclusion Mr. Hey draws is, "that reduction might sometimes be effected with less extension than is commonly used, and consequently with less pain:" it appears to him, "that the muscles when so far stretched as to be rendered painful, begin to re-act and resist the efforts made for their further elongation." The fact seems to me to be still this; it is the direction of the humerus more than the force employed which occasions the seeming difference in the various cases of dislocation.

Mr. Hey observes, "When the head of the bone has deserted the axilla, and has slipped under the pectoral muscle, I have observed that it is brought back into the axilla the more readily if the extension is made in a direction opposite to that in which it has passed from the axilla. This effect is often greatly promoted by making the extension with the arm elevated as Mr. White has advised. But when the head of the bone has advanced far under the pectoral muscle, strong extension by closing the passage through which the protuberant part of the bone should return, often prevents instead of promoting reduction." p. 291.

The first part of this quotation resolves into the advice, that the bone must be elevated to the position in which it was when dislocated, before the force be used to extend the arm. The second part of the excerpt has, however, a reference to the opinion that the bone passes through a noose, which I hope I have shown to be a groundless supposition.

In Case IV. we have these words: "The body being supported, and counter extension made by means of a broad towel put round the thorax of the patient, the extension of the arm was made by three or four men, first in a direction at right angles to the body, and when the extension was in its greatest degree, by pulling the arm towards the ground at an acute angle with the body, while I attempted to raise the head of the bone by my hands placed as near it as I could. This method failed; so did that with the heel in the axilla."

So I conceive the attempt in this way will ever do if the state of the ligament be as I have alleged. Then it will be asked, how does it happen that simply by extending the arm at right angles with the body the dislocation is so often reduced? I believe the fact to be, that the arm is not at right angles with the body in most of the cases thus reduced, but that the counter extension being made imperfectly, the body of the patient falls so far towards the assistants, that the inclination of the humerus is changed to that direction which I have so much insisted upon as being necessary to reduction. For it is not the position of the arm, or of the patient's body,

but the relation betwixt the humerus and scapula that is important.

There is a method by which the operator's neck is yoked to the patient : a towel is put under the arm-pit and over the surgeon's neck, who raises himself while the assistants pull ; he thinks he assists the reduction by raising the humerus over the edge of the glenoid cavity, while he is only pressing the head of the humerus against the neck of the scapula. This is somewhat more harmless, but no less unscientific, with the operation of the ambe, or the dragging by the wrist with the heel in the axilla. In all these cases it is still locking of the bones, or the ligament which resists, by preventing the extension of the limb.

I return to Mr. Hey's Cases :—In Case VI. after several methods had been tried, as Freke's improved ambe, that by the towel round the operator's neck, &c. he proceeds, " Mr. Lucas and Mr. Jones afterwards tried to reduce the bone by the heel in the axilla, and Mr. Lucas perceived a noise during one effort as if the bone had returned to its place. While the last method was in use it occurred to me, that extension made in a direction parallel to that of the body was not likely to succeed, while the head of the bone lay so deeply sunk, and behind the pectoral muscle. I therefore advised, that one person should extend the arm at right angles to the body, by a hold of the fore-arm, placing his foot against the side of the patient's thorax. In this way the person making the extension would not only have a firm support, but would also be enabled to repress the lower part of the scapula by his heel placed against it. That during this extension another person lying by the side of the patient, should place his heel against the upper part of the os humeri, as near to its head as possible, and should push it in a direction parallel to that of the patient's body. By this method the bone altered its situation with such a noise as is usually heard in reductions, and we concluded that the head of the bone had re-entered the socket ; but when the arm was brought close to the patient's side, we found that the head of the bone was still in the

axilla. This appearance of success encouraged us however to repeat the operation, but the event was the same. We now imagined that some portion of the capsular ligament might be folded so as to be intercepted between the head of the bone and the glenoid cavity, into which we judged the bone to have been twice brought. On this supposition, after making the reduction the third time, the os humeri was moved in various directions, sometimes upon its own axis, sometimes upwards and downwards, before we attempted to bring the arm to the patient's side. Also while the extension was continued, a flattened ball of tow was thrust up into the axilla by the heel, to prevent the head of the bone from retiring again into the axilla; the arm was then brought into contact with the patient's side, &c. by this means the reduction was completed and confirmed." See p. 297.

REMARKS. This is a just picture of the bustle, the varied and ill directed efforts where there is no principle drawn from anatomy to direct the operator.

The next Case Mr. Hey gives, is one where after some ineffectual endeavours the bone was reduced by the assistants elevating the patient by towels round the arm from his seat on the ground, and then, while the arm was thus stretched, carrying it forward.

Further experience must determine, says Mr. Hey, whether this method of reduction is superior to those which he has mentioned. Now we believe that what is called experience has kept this part of surgery in unusual darkness. Let any person take the dissected shoulder joint in his hand, and there will be no occasion for further experience to inform him that this is the best of all the methods employed by Mr. Hey. The reason I hope I have sufficiently explained already. One more observation I am led to by Mr. Hey's work; in page 304 he says, that in several of the cases the counter extension was applied so as to press back the inferior angle of the scapula, contrary to the directions given by Mr. Bromfield, who used to cause the acromion to be pushed backward. These different methods of practice, he adds, merit an atten-



tive comparison, that it may be decided on which side the superiority lies. I hope the question is easily decided ; when the surgeon pulls the arm at a right angle with the body, and at the same time pushes back the lower angle of the scapula, he brings the bones into that position which relaxes the remaining connexions of the joint, and relieves the check which impeded the reduction. The truth is, I believe, that we cannot throw back the acromion, but in as much as we can we prevent the reduction in difficult cases, unless we at the same time elevate the arm bone.

From considering the position of the head of the humerus, and effect of the ligament; and the position of the two great processes of the scapula, it appears to me, that the motion to be employed completely to relax the ligament, and move the head of the humerus over the brim of the glenoid cavity, is this, let the arm be extended until the head of the humerus is felt to be drawn from the hollow of the axilla ; the arm is then to be raised and moved in a circular direction towards the side of the patient's face. In this movement the neck of the humerus first bears on the acromion, and then on the coracoid process of the scapula ; against the last process the lesser tubercle of the humerus bears so, that with the lever power of the humerus its articulating head is raised over the edge of the glenoid cavity, and slips into its place.

#### DISLOCATION OF THE ELBOW.

THE dislocation of the ulna from its connexion with the lower end of the humerus happens in young people chiefly, in whom the coronoid process of the ulna is not so complete a guard to the joint as it becomes in the adult. A person who running falls on his hands and wrist may dislocate the ulna, because the whole weight and shock is received on the elbow joint, in the line of the ulna ; and in this direction the coronoid process is the sole guard against dislocation. The ulna starts backward, and the olecranon and articulating part of the ulna is thrown out behind the arm bone. The promi-

presence of the olecranon behind the joint, and the painful rigidity of the arm, sufficiently distinguish the nature of the accident. I need scarcely add, that so firm is the union of the radius with the ulna, that both bones are dislocated when the ulna is felt thus out of place.

To reduce the dislocation of the ulna, the surgeon bends the arm; he puts a handkerchief round the patient's arm, and gives it to an assistant to hold, who stands behind; then with the left hand he takes hold of the arm, and with the palm of the right hand on the olecranon, he endeavours, by pushing, to restore the bone to its place. An assistant may facilitate the reduction by taking hold and pulling by the wrist, and gently bending the arm at the same time.

However, this will not always do, and a coarser and more dangerous means has been used. The surgeon has been forced to grasp the arm with one hand, and the wrist with another, and then thrust his knee into the fore part of the elbow joint; and by this means bend the joint and reduce the dislocation. It will be observed, that the difficulty of reduction proceeds from the coronoid process of the ulna checking into the posterior fossa of the humerus, and this operation by bending, and at the same time pulling separate the bones, is the most effectual way of reducing the dislocation. It would, however, be a very terrible accident during this operation, to find that we had separated the apophysis, which may certainly happen in a child!

#### SUBLUXATION OF THE ELBOW JOINT.

THE subluxation of the elbow joint is when the sigmoid cavity of the ulna is forced laterally, and passes over the prominent part of the trochlea of the humerus; the articulating surface of the ulna sits in that part of the humerus appropriated to the head of the radius.

The nature of the accident is ascertained by the circumstance of the great increase of the space betwixt the inner con-

dyle of the humerus and the prominence of the olecranon ; the motion of the joint is impeded.

To reduce this subluxation the fore arm must be extended and drawn ; while it is kept stretched, the surgeon uses lateral pressure, by putting the thumb strongly over the inner condyle of the humerus, and grasping the head of the radius with the fingers of the same hand.

#### DISLOCATION OF THE HEAD OF THE RADIUS AT THE ELBOW JOINT.

DISLOCATION of the lesser head of the radius is a consequence of a violent and sudden twist given to the wrist. It is accompanied with a diastasis of the bones of the fore arm.

The distinguishing marks of this dislocation are, that the fore arm cannot be bent, and the rotation of the wrist is painful. The reason why the elbow joint cannot be bent, is because the small head of the radius has burst from the coronary ligament and capsule, and now stands prominent forwards, so that when the fore arm is bent upon the arm, the head of the radius strikes against the fore part of the humerus.

To reduce this dislocation we pull upon the wrist, and direct the hand so as to make the force bear more on the radius than on the ulna ; at the same time, by twisting the hand to pronation we pull the radius still more. Whilst this is doing by grasping the upper part of the fore arm as if to crush the bones together, we endeavour to force the radius into its place. We know when the reduction takes place by the flexion of the arm being no longer impeded. When the dislocation is reduced, as the action of the muscles has no tendency to retain it in its place, it will be necessary to use a bandage, to bind the fore arm, and to keep the arm in a bent position.

#### DISLOCATION OF THE WRIST.

THE os scaphoides and the lunare forming a pretty regular ball are sometimes dislocated from the articulating surface of

the radius, viz. the scaphoid cavity. This may happen in consequence of the wrist being twisted ; but still oftener from endeavouring in a fall to support one's self on the palms of the hands ; by the shock the carpal bones are driven past the head of the radius.

To reduce this dislocation let an assistant interweave his fingers with those of the patient and pull ; the surgeon withholds the lower part of the fore arm with his left hand, with the right moves the patient's hand, and occasionally adds his strength to the effort of the assistant.

#### DISLOCATION OF THE BONES OF THE HAND.

As the bones of the wrist are of a wedge form, and in their union constitute an arch ; the central bones are, by lateral pressure on this arch, liable to be forced from their place. By a bruise of the wrist then, we may have one of the carpal bones luxated and standing prominent. Let not the prominence formed by the thickening of the periosteum and ligament in consequence of a wrench, or blow on the back of the hand or wrist, be mistaken for this dislocation. When the bone is displaced, it may be reduced by pressure. I have been told of bone-setters who could strike them into their places with a blow of the hand.

#### OF THE DISLOCATION OF THE THUMB, AND FINGERS.

To the young surgeon it is most unsatisfactory to be told merely, that when the fingers or thumb are dislocated, they are to be reduced and bandaged ; while he finds that by using all his force he cannot reduce them. That such general expressions shall usurp the place of precise and intelligible rules of practice is much to be regretted, since it often happens that a patient returns even from eminent surgeons with his thumbs still dislocated ; and the thumb has been absolutely torn off at the second joint in the attempt to reduce the dislocation of the first !

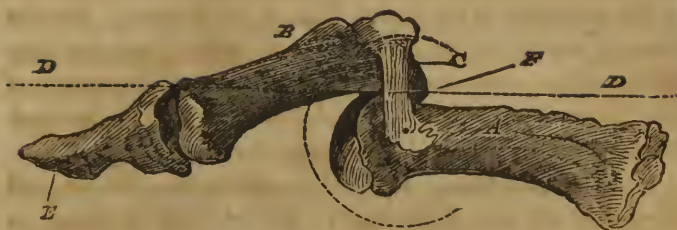


From the same cause there is a difficulty to be encountered in the reduction of the thumb, and of the fingers! But the bones of the thumb being shorter and thicker, and the ligaments of the joints stronger, it is only in the dislocation of the thumb that we have remarkable examples of the ineffectual violence used in the attempt at reduction.

TO REDUCE A DISLOCATION OF A FINGER, we must not pull directly on the end of the finger; for that will be found to fix the bones by their own ligaments, so that they cannot come into their place. It is by grasping the finger forcibly, and bending it, that we shall succeed in bringing the heads of the bones into their natural relations.

Thus far I speak from experience, but as to the dislocation of the thumb I must reason from the anatomy, for it has not been my fortune to reduce a dislocated thumb.

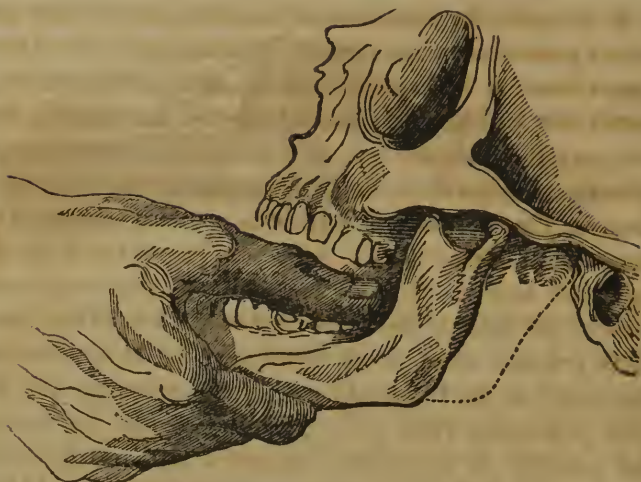
We find, that in the attempt to reduce the first joint of the thumb, the second phalanx has been torn off; this should convince us that the difficulty proceeds from the ligaments; for the muscles of the thumb could not bear such a degree of violence. When we have recourse to the anatomy we find, that the bones are united by a proper hinge joint; that there are strong lateral ligaments; and that the articulating heads of the bones are square, and have somewhat of a wedge form. Mr. Hey, taking these circumstances into consideration, has been led to the conclusion, that the difficulty of reduction proceeds from the head of the bone being pushed between the ligaments, in which situation the ligaments bind the bones together, and retain them locked. I should have expected that Mr. Hey would have followed up these observations with the rule of practice, viz. that we must bend the thumb at the dislocated joint, so as to carry the head of the bone which is dislocated in a semicircular movement round the articulating head of the metacarpal bone, before we can expect it to be brought through the two lateral ligaments.



I shall suppose that A is the metacarpal bone of the thumb; B is the first bone of the thumb dislocated from the metacarpal bone; and C is the lateral ligament. Now let us suppose that the hitch is put over the thumb at B, and that it is drawn in the direction of the line D D. It must follow, that the point E will rise to D, and the heads of the bones be consequently locked at F.

To reduce the dislocation without lacerating the lateral ligament, it is evident that the dislocated head of the bone must be moved in the circular dotted line, which is the exact reverse of its motion when dislocated.

I have a conviction, though I cannot give the proof, that by attending to the principle laid down here, the dislocated thumb may always be reduced. But should it be otherwise, should a case occur where many ineffectual endeavours have been made, and the patient resists all further violence, so thoroughly am I convinced that the difficulty proceeds from the lateral ligaments embracing the head of the bone, that I would insinuate the couching needle under the skin (obliquely), and cut one of the lateral ligaments, when I think there would occur no further difficulty in reducing the bone. After this the joint would require to be supported by a small splint and bandage. This is a mere opinion,—a proposition to stand contrasted with the alternative of the thumb remaining unreduced and lame.



DISLOCATION OF THE LOWER JAW.

If when the mouth is open a man receives a blow on the chin, the jaw may be dislocated. The jaw being in this case dropt to its utmost limit, the angle of the jaw becomes the fulchrum, and the blow on the chin forces the condyloid process forward from its seat in the articulating hollow of the temporal bone ; it starts over the root of the zygomatic process. One or both condyles may be dislocated.

The marks of the dislocation are these :—1. The mouth is open, and the teeth do not correspond. 2. On putting the finger on the root of the zygomatic process before the ear, and making the patient attempt to move the jaw, if the bone be in its place we ought to feel the prominence of the condyle of the jaw ; but if dislocation has taken place there is a hollow before the ear. The coronoid process of the lower jaw is felt prominent in the cheek when the bone is dislocated. 3. The jaw is protruded forward, or is distorted. 4. Saliva flows from the mouth ; the speech and deglutition are somewhat impeded.

When one condyle only is dislocated it is known by the depression being felt before the ear of one side only, and by the lateral position of the chin.

In reducing the dislocation of the lower jaw we must provide a protection to the thumbs, by wrapping a bit of linen round them, or by wearing a strong glove. The patient is seated low, and his head is held firmly by an assistant. The surgeon puts his thumbs deep into the mouth, so that they rest upon the grinding teeth, the fingers grasp the chin and base of the jaw. The back part of the jaw is to be forced downward by the strength of the thumbs, while the chin is lifted by the palm and fingers. By this exertion the surgeon endeavours to carry the condyle under the level of the root of the zygomatic process; which stands an eminence before the articulating surface of the temporal bone; which protected the jaw from dislocation when in its natural situation; and which now prevents its reduction. As soon as the condyles of the lower jaw are freed from the eminence of the temporal bone, the muscles of the jaw draw them into their places, and sometimes with so much spasmodic force as to close the teeth and bruise the surgeon's thumbs; to avoid which, he slips them off the grinding teeth upon the gums and cheek.

If the surgeon does not succeed in reducing the jaw by attempting to push both condyles into their place at once, he then attempts to reduce first one side, and then the other.

To preserve the jaw in its place it is only necessary to put some check upon the opening of the jaw further than is necessary to eating and speaking.

#### DISLOCATION OF THE HORN OF THE OS HYOIDES.

THE dislocation of the horn of the os hyoides is a consequence of swallowing a large morsel. The nature of this case was discovered by Valsalva. It is attended with a sudden difficulty of swallowing, with an uneasy sensation which excites the muscles of deglutition into frequent action. There is a painful prominence of the bone, to the feeling like a tumour on the throat.

I have not seen this kind of dislocation. The manner of replacing it is by pressing and molding the parts on the out-



side of the throat with the fingers of one hand, while the forefinger of the other hand is put into the mouth, and as far as possible over the root of the tongue, so that the tongue, and consequently the body of the os hyoides, may be pressed forward.

I am at some loss, however, to understand how a bandage can be applied here so as to keep the bones in their due relation.

#### DISLOCATION OF THE CARTILAGE OF THE RIB FROM THE STERNUM.

A young man playing the dumb bells, and throwing his arms behind him, feels something give way on the chest; and one of the cartilages of the ribs has started and stands prominent. To reduce it we make the patient draw a full inspiration, and with the fingers knead the projecting cartilage into its place. We apply a compress and bandage: but the luxation is with difficulty retained.

#### OF THE DISLOCATION, OR DIASTASIS, OF THE BONES OF THE PELVIS.

IN the many dissections which I have made of women who have died in delivery, I have not seen one instance of spontaneous separation, or loosening of the bones of the pelvis.— Though I have dissected three women who have died, I may say of distorted pelvis, (since the difficulty of the birth from the narrowness of the pelvis was the cause of death,) and, though after opening the womb I have with great difficulty pulled the head of the compressed child from the bones of the mother, yet I have not found the joining of the ossa pubis loosened or relaxed. If there had been any provision in nature in the dilatability of the bones of the pelvis for the easy birth of the child, surely it must have been apparent in the only case which could require such a provision, viz. where the pelvis is distorted, and the diameters diminished.

When the symphysis pubis separates in pregnant women, a weakness and pain of the loins are remarkable symptoms previous to labour; and after delivery there is an inability of moving, or standing, all which indicate disease, and not a natural provision for easy labour. I believe then, that the separation of the bones of the pelvis may be considered as a spontaneous, but not a natural loosening of the bones; and that the force of labour succeeding to this looseness of the joinings actually burst them up.

When the bones of the pubes separate in labour, the symptoms are, (besides what I have already mentioned,) a jarring of the bones felt during delivery;\* pain and fever succeeding the delivery; when the woman attempts to rise she cannot stand, or even sit for any considerable time; hectic fever succeeds, and she is for a long time bed-ridden. If the separation of the ossa pubis has been considerable, then the posterior symphysis of the pelvis also suffers; and if the disposition to disease be great, suppuration may take place, both behind the pubis, so as to be discharged from the vagina, and on the hip from the sacro iliac symphysis.

When there has been much suppuration, it is possible that the bones may at last unite, and ankylose by a medium of bone. By neglect, if I mistake not, in cases where there is less tendency to caries, this species of subluxation produces a moveable joint where there should be a symphysis, or firm union by cartilage.

I have not attended a case of *diastasis*, or separation of the bones of the pelvis; but I have ascertained, by dissection, the effects of the spraining of the joinings of the pelvis. I found an abscess within the pelvis; the ilium and sacrum were disjoined, and the cartilage was wasted, and the ligaments destroyed, and the bones extensively carious. Such was found to be the consequence of the operation of the *sectio symphysis pubis* when that horrid operation was perpetrated in France.

\* See Denman, vol. i. p. 24.

The surgical treatment of the diastasis of the bones of the pelvis, I am afraid must be confined to the binding together the circle of the bones ; for external applications, though recommended on the best authority, cannot avail nor reach the seat of disease. A broad bandage of leather softly quilted, and made to draw with buckles, ought to be put round betwixt the spine of the ilium and the head of the thigh bone. This will prevent the jarring of the bones, and allay the irritation. We know how incessantly the pelvis rolls on the thigh bone, and we know how this motion keeps up, and fosters the inflammation in the hip joint. So in the present instance, the perfect circle of the pelvis being interrupted, and the junctures loose, every change of posture causes a motion of the bones, and continues the injury.

Should there be a diseased joint thus formed, either in the anterior or the posterior symphysis of the pelvis, I see no treatment more likely to effect a cure than the counter irritation by issues.

#### DISLOCATION OF THE OS COCCYGIS.

By a kick, or fall, the os coccygis may be dislocated. The injury to the parts from the violence rather than the wrong position of the bone, occasions retention of urine, or tenesmus, or even abscess, near the rectum.

To reduce this bone the finger of one hand is introduced into the rectum, while by the co-operation of the fingers of the other hand on the outside, the dislocated bone is brought into its place : no bandage will be required to keep this bone in its natural situation.

#### DISLOCATION OF THE HIP JOINT.

THE dislocation of the thigh bone from the acetabulum of the os innominatum is a most serious accident ; as, besides the dread naturally arising from the application of a force equal to the bursting up of this strong joint, we have to fear the

wasting of the bones, or a partial destruction of the joint, and permanent lameness. Yet these consequent effects are apt to follow only where, besides the dislocation, the internal part of the joint has been bruised, or there is a tendency to scrophulous action in the system.

OF DISLOCATION WHERE THE HEAD OF THE THIGH BONE LIES  
ON THE BACK OF THE ILIUM.

THE dislocation of the thigh bone upwards is marked by the shortness and strained position of the limb. It is distorted; the knee and toes are turned inward, and the thigh is bent. When we turn the patient on his belly, and bending the leg, take hold of the heel, move the leg, (like a lever), laterally, and at the same time put the hand upon the trochanter, we feel that the motion is interrupted and checked, and particularly that when the heel is rapidly moved inward, that the head of the thigh bone strikes against the back of the ilium, so that the motion of the thigh bone on its own axis is much limited. The attempt to stretch the limb is not successful without much force, and is very painful. The head of the thigh bone may be felt as well as the trochanter, both lying on the ilium. There is pain in the groin, and a bent position of the thigh to relieve the pain and tension.

The position of the parts considered anatomically is this: the head of the thigh bone having been started from its socket lies on the back of the ilium; the articulating head of the luxated bone is towards the sacro-sciatic notch; the trochanter is more forward, and rests upon the ilium also; the capsular ligament, and the round central ligament of the hip joint, are torn; the head of the thigh bone has torn up the cellular membrane under the gluteus medius, and lies under that muscle.





*A, the back of the ilium ; B, the thyroid hole ; C, the acetabulum-left empty ; D, the head of the femur ; E, the trochanter major ; F, the shaft of the thigh bone.*

The limb operating like a long lever is here also the cause of dislocation. When a man is pushed down on his side, and the haunch strikes the ground ; when carrying a heavy burthen he falls down with the leg and thigh obliquely under him ; or, when, in riding, the horse falls on his side, and the rider's thigh is under the horse, the ligaments of the hip joint may be burst up, and the thigh bone dislocated. I have found a man who had been buried under a bank of earth with his thigh bone thus dislocated upwards and outwards ; though most frequently I am inclined to believe the head of the thigh bone will be dislocated downward, if displaced at all in these circumstances.

*Manner of reducing the thigh bone when dislocated upwards.*

If in an hospital, the patient is to be laid on a strong table, which is screwed to the floor ; folded blankets are to be placed under him ; a soft compress is put in the perineum ; if the right thigh bone be dislocated then the patient is to be on his left side, or so that he may rest on the left hip, and that we

may feel and observe the position of the dislocated bone. A sheet is to be folded so that it may be laid upon the perineum, and its ends tied firmly to the table. A quilted strap is to be laid betwixt the spinous process of the os ilium and the head of the thigh bone, and the ends of this are to be fixed to the sheet. The strong leather band with hooks, (which are to be found in the shops for this purpose,) are to be placed above the knee that they may take hold of the thigh bone above the condyles\*.

But we may have to reduce the dislocated thigh bone when we have no hospital apparatus, and therefore we must think of our means when in a private chamber. We first fix the bed, then wrap around the bed post a sheet or blanket. The patient being laid on the bed with his thighs on each side of the post, he is then to lie down inclined towards the opposite side from that which is to suffer the operation. In this position when the pull is made on the dislocated thigh the tuber ischii and perineum are made to press against the bed post. The patient's body is to be kept down in this position by an assistant. It is the duty of this assistant at the same time to observe that the pelvis and trunk do not move upon the sound hip joint; for which purpose he has to lay himself on the bed, and keep hold upon the spine of the patient's ilium.

The laques or hitches, may be made of hand-towels, and placed above the knee, so that they take hold of the condyles of the thigh bone. The knee is to be bent, and the leg and foot used as a lever to move the head of the bone in a rotatory manner. It is said, that when one of the towels is brought on the inside of the knee this rotation is impeded. I do not remember to have experienced any difficulty in reducing a dislocated thigh in this manner, though it had continued unreduced for three weeks. At the same time, if we consider the direction of the force to be employed, and the position of

\* In cases of dislocation where much force is to be used, a few turns of a flannel roller should be put round the limb before fixing this apparatus.

the thigh bone, there can be no objection to the laques being brought to the outside of the knee only.

Whilst strong men pull the thigh by the laques in the line of the body, and an assistant holds the knee and ankle to give the rotatory motion, the surgeon should be placed with his hand on the joint; he may press down the trochanter, but he will do little good or harm by his efforts there: he cannot press the trochanter down without at the same time pressing it to the back of the ilium, which must have the effect of delaying the reduction.

Sufficient elongation of the thigh I believe to be all that is absolutely necessary to reduction, but the elevation of the head of the thigh bone over the brim of the acetabulum will be much facilitated by the rotation of the thigh, especially by a pretty forcible jirk of the heel outward when the head of the thigh bone is brought to the level of the margin of the acetabulum. No cunning exertion on the part of the surgeon is required in this stage of the operation; the head of the bone goes with an audible snap into the socket; the perfect relief satisfies the patient that the bone is reduced. He is inclined to take as little freedom in motion after reduction as can be required by the most cautious surgeon. Unless the acetabulum is broken or diseased, there is no fear of the thigh bone again escaping from the socket.

#### OF THE DISLOCATION OF THE THIGH BONE DOWNWARD.

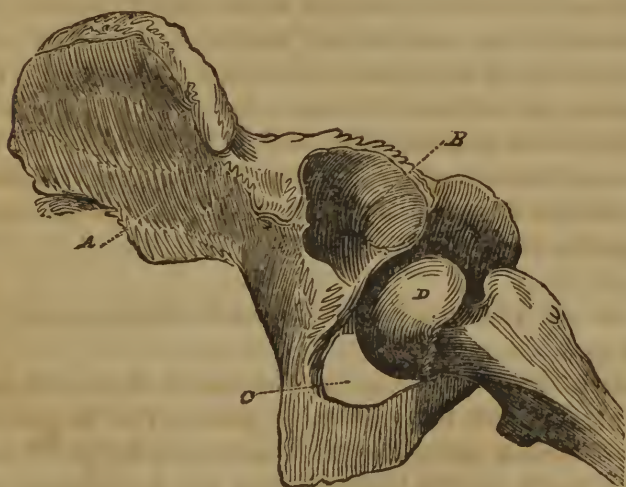
THE thigh bone is sometimes dislocated downward and forward, so that the head of the bone rests in the thyroid hole, or rather on the obturator ligament and muscle. I conceive this to be a kind of dislocation less frequent than the last, though I see observations contradicting this opinion.

It will be recollected, that the lower margin of the acetabulum is eked out by a ligament, but nevertheless that this part of the socket is not so well calculated to restrain the head of the thigh bone as the upper part of the circle. The dislocation downwards, therefore, would often happen were the

force as likely to be applied so as to displace the bone downwards as to dislocate it upward.

When there is a resistance low on the hip, and the trunk is forcibly twisted over to the same side, the thigh bone may be dislocated downward and forward : or, when a man is crushed down by a weight on the hip, or when the foot slips from under him, so that the perineum touches the ground, the head of the thigh bone may be dislocated in this direction, viz. downward and forward. If the head of the bone is displaced by its slipping over the lower margin of the acetabulum, it must fall a little forwards and lodge on the thyroid hole.

There can be no difficulty in distinguishing this kind of dislocation from all other accidents to which the hip joint is liable ; the thigh is lengthened, and the knee and toe turned outward ; the limb straddles, and is with difficulty and pain brought to the line of the body.



We have the explanation of all these circumstances in this sketch of the position of the thigh bone upon the ilium.

*A, the hollow of the os ilii ; B, the acetabulum left empty ; C, the thyroid foramen ; D, the head of the femur, dislocated and resting in the thyroid hole.*



OF THE REDUCTION OF THE THIGH BONE WHEN DISLOCATED  
DOWNWARD.

THE reader might imagine, that as the limb is already too long there can be no necessity for applying an apparatus, to stretch it as in the last instance ; nevertheless, the position, the manner of securing the patient and of applying the laques to the limb, may be the same in this case as in the last ; that is, on the idea that the limb must be somewhat further stretched before it can be reduced. But it requires to be particularly noticed, that in this instance of dislocation of the thigh bone downward, the head of the bone must be lifted from the place in which it is lodged, and raised to the level of the acetabulum before it can be reinstated in the socket. It might at first appear, that by using the thigh bone as a lever, the ramus ischii being the fulcrum, it would be possible to raise the head of the bone from the thyroid hole by pressing the thigh backward and inward. But when we consider the position of the knee and toes, it is evident that the great trochanter is carried so far downward, that by this motion it would be carried under the ramus of the ischium, and that consequently, the reduction would be checked and impeded.

A fulcrum, or fixed point, must therefore be supplied to enable us to operate with effect in this position of the limb and trunk.

For this purpose a large towel or table cloth is put round the thigh, and carried as near the perineum as may be. The ends of this cloth are to be held up by strong assistants. While the thigh is gently drawn so as to extend it, the cloth is at the same time raised and carried a little backward, so that the head of the thigh bone may be lifted from the depression in which it lies. The thigh is then bent (by carrying the knee forward) and drawn in that direction ; our last resource is to carry the knee to the ground, that is, towards the other side of the patient's body. In this operation we make the cloth which is put under the upper part of the thigh, a stay, or fulcrum, and by using the thigh as a lever

we unfix and raise the head of the bone. We may during this operation, roll the thigh by taking hold of the knee and ancle as heretofore described.

We may perhaps find reason to prefer the following method of reducing the thigh bone when dislocated downward. The patient is set upright on his breech, his thighs on each side of a strong pillar ; or he may be seated on the corner of a bed, the bed-post betwixt his thighs ; something soft is wrapt round the post, and a person is placed behind him to prevent him from reclining backward, and to keep him to the seat.

The extension of the thigh is accomplished by drawing it at right angles with the trunk. My reader will readily understand that by this operation the head of the thigh bone is drawn out of the hollow in which it lies, and lifted as it were into its proper socket. If drawing in this direction simply does not succeed, then the cloth is at the same time to be put round the thigh as before, so as to draw the head of the thigh bone outward, while the knees are brought together.

There is mention made of a kind of dislocation which, when looking on the subject, I should say is little likely to happen—the dislocation of the thigh bone upward, while the articulating head is forward on the ilium, and the trochanter backward ; it will be characterised by the union of the two most distinguishing signs of the other kinds of dislocation, viz. the shortening of the limb while the knee and toes are turned outward.

When the thigh bone is reduced there is little fear of its starting again from its place ; all that is done on this account is to put some slight binding around the thighs to check their motion. What is to be feared is inflammation in the joint, and gradual wasting of the head of the thigh bone, of which I have lately seen a case. This I must suppose owing to some badness of constitution. I would treat it as the consecutive dislocation, viz. where the head of the thigh is displaced in consequence of diseased action filling up the acetabulum.

## DISLOCATION OF THE PATELLA.

THE dislocation of the patella, or knee-pan, is not an unfrequent accident. A man falling, so that the outside of the patella is struck while the muscles of the patella are not firmly braced, and the limb is nearly extended, suffers this dislocation. From the nature of the accident I have described, it is implied that the bone is dislocated inward. It is most frequently displaced inward, owing to the lesser degree of elevation of the inner condyle; but it is also driven to the outside of the knee joint sometimes.

This dislocation of the patella is easily ascertained, and the reduction is not difficult. The leg is to be extended, and the thumbs applied to the bone, while the fingers grasp the knee joint. If a difficulty occur it is owing to the ligament of the patella preventing that bone from surmounting the condyle. In this case, as it is impossible to stretch the ligamentous connexion of the patella with the tibia, so we must have recourse to the further relaxation of the muscles inserted into the patella, and press the patella downward before we attempt to carry it to its place betwixt the condyles.

A laced cap for the knee is to be used after the reduction, to hold the patella in its proper place of lodgment.

OF THE INJURY OF THE INNER LATERAL LIGAMENT OF THE  
KNEE JOINT.

THIS is an accident which I do not see noticed. I have seen it in various degrees, and have had an opportunity of ascertaining the state of the parts in dissection.



The internal lateral ligament of the knee joint must suffer in a particular manner whenever there is a stress and unusual force upon the joint from a shock perpendicular to the limb. In this plate, A, is the thigh bone; B, the tibia; C, the inner lateral ligament. The force of the trunk bearing on the head of the thigh bone in the direction of the dotted line, must injure, or entirely burst up the ligament at C.

So it happens, that a person descending a stair, and thinking that he has come to the landing-place when one step is still to take, falls with the weight of the body bearing on this ligament, and sprains it. How this is most apt to happen to women is evident, considering the greater width of their pelvis, and peculiar obliquity of their thigh bone. For the more removed the thigh bone is from the perpendicular, the more apt is the inner ligament to be sprained.

If the violence be great, we can readily conceive how the ligament is actually torn, so as to produce

#### A SUBLUXATION OF THE KNEE JOINT.

If this accident should occur, which I confess I have not seen, there can be no impediment to reduction. When re-



duced, our attention should be chiefly directed to restrain the rising inflammation, and to sustain the limb in its natural position by a splint and bandage.

But I am bound to direct my readers' attention more particularly to what I have seen and practised. When the inner lateral ligament is partially lacerated, or even strained only, there comes upon the part, slowly, inflammation and relaxation. The patient feels great pain in walking; the knee gradually falls inward, with increasing lameness. The yielding of the ligament on the inside of the knee joint being attended with increased obliquity of the thigh bone, the chance of further injury increases, until at every step the weight of the body bears on the relaxed and inflamed ligament.

On dissection I have found the cellular substance and lateral ligament, and capsule, on the inside of the knee much thickened. While they were thickened the ligamentous substance was at the same time extended, so that there was not sufficient guard to the joint on this side.

We understand that this thickening and inflamed state of the ligament, being a change of texture and constitution, it is followed by increasing weakness as an inevitable consequence of diminished density. The method of *CURE* therefore, will be in the first place to guard against all repetition of the injury, and to change this chronic inflammation. The first of these requires the application of a splint along the outside of the knee, with such a bandage around the lower part of the thigh and the upper part of the tibia, as may support the joint while there is no pressure made on the injured part. When the stiff splint has been used for a time; motion may be allowed to the knee by a jointed splint applied like the former, which, while it prevents the yielding of the knee joint inwardly, allows the natural flexion. The second part of the design is accomplished by applying successive blisters to the inside of the knee.

I ought, perhaps, to have mentioned under the head of fractures, that if the knee joint of a boy be twisted violently

in machinery, the apophysis of the bones may be separated. I lately examined a case where a young man being caught in the spokes of a carriage by the leg while riding behind, had the lower end of the femur separated by diastasis.

## DISLOCATION OF THE ANCLE JOINT.

I HAVE already explained the nature of the compound dislocation of the ancle joint, where the lower head of the tibia has burst the deltoid ligament which protects the inner ancle, and the fibula is broken a little above the external malleolus. I have only at present to make some remarks on the degrees of injury to the joint.

1. As in the instance just now stated of the injury of the lateral ligament of the knee joint, we have to notice the consequences of the lesser and partial sprains of the inner ligaments of the ancle joint. If, in stepping on an unequal pavement, the ball of the great toe be not supported so as to make a balance to the external position of the heel, the foot is twisted, and the inner ligament of the joint is injured, and although not ruptured, it inflames and becomes weak.

2. I am often asked by my younger pupils what is to be done when the lower head of the tibia is actually forced from the astragalus, and the joint is laid open. Undoubtedly the practice is still to save the foot, and not to amputate. We replace the bones, and bind them, trusting that by bleeding and cold we can keep down the inflammation. No doubt circumstances of the patient's constitution and situation will qualify the rule.

3. A patient of a bad habit, and in a London hospital, will be doomed to suffer amputation, when in other circumstances he might be saved. We must too in all such cases take into consideration the degree of contusion which the part has suffered.

4. If a man in leaping from a gig shall lacerate the ancle joint, the foot may be saved.

5. If the wheel has passed over the joint, so as to displace the bones and open the joint, though in exactly the same degree, amputation will be necessary, from the general contusion of the parts.

I state the circumstances thus to prevent my reader from imagining that in any such case he is to trust to an absolute rule or aphorism, for with the same degree of laceration in the joint, the degree of *injury* may be greatly varied.

The ancle joint may be dislocated by the tibia and fibula slipping before the astragalus. It will be ascertained by the great projection of the heel. It is to be reduced by applying the laques so as to catch upon the heel, and at the same time to pull on the fore part of the foot, by which means the toes are pointed, and the gastrocnemius relaxed.

In closing my observations on the injuries of the bones and joints it becomes a duty to remind the young surgeon of the great advantage to be derived from the general healthy state of the body in the final cure of local injuries of these parts; that is, of good air most especially, of better diet than that to which the patient has been accustomed\*; even of exercise, if it can be allowed in the circumstances of the case. It becomes him to observe too, if there be any scrophulous tendency in his patient, and to endeavour to counteract it; for injury of the bones and joints is apt to rouse scrophulous action if there be the slightest tendency to it. We are informed that the bones of scrophulous people contain a smaller portion of earth than when the part has its healthy constitution. I would not be understood to say, however, that on this account they are more susceptible of diseased action, though they certainly are more liable to disease; they are more liable to be fractured and the ligaments of the joint having a tendency to

\* Even although the patient has been nursed in luxury and great abundance it is possible to ameliorate his condition; though it must be confessed we possess more advantage when from the privations to which an hospital patient has been accustomed he can be put on a more generous diet.

inflammation and soften, they are also more likely to be injured by sprains.

For these reasons it is necessary that we should know the characters of scrophula, that we should be able to recognize the disease under its symptoms,—the indolent swellings of the glands of the neck; the softness of the skin, and the laxity of flesh; the largeness of the joints; the light hair and fair complexion, and smooth skin; the tender eye-lids and swelled lips; or the dark sooty hair, with cheeks of a broken ruddy colour and swelled features. If there be ulcers, either previous to the injury or in consequence of it, we find them pale, shining, and indolent, with little pain or inflammation.

If such should chance to be the constitution of a patient who has suffered injury of the bones or joints, the cure is more precarious, and certainly more tedious; the predisposition must be watched and counteracted.

The skin ought to be kept soft, and the vessels of the surface active, by the use of the warm bath and friction. The glands and glandular viscera may be kept free of the congestion of the indolent habit by occasional doses of calomel, and perhaps bark, iron, or acids, eventually used as giving vigour to the system.



## CHAPTER IX.

## OF TUMOURS,

AND

OF THE OPERATIONS TO BE PERFORMED ON THEM.

---

ALTHOUGH it be my object here, consistently with my original plan, to treat only of the manner of extirpating tumours, it appears to me that if I were to proceed to describe the manner of operating, without shewing the difficulty of discriminating the cases proper for operation, I should be in danger of doing more harm than good.

The subject of tumours is involved in unusual obscurity. There has been much done of late to draw the attention of the profession to the subject; diseases have been accurately described, and most interesting cases brought forward; yet I feel at this moment the difficulty of entering on the subject without altogether deviating from modern authority. Theories have been entertained which I think defective; authors have supposed they were making accurate definitions when they were only framing hypotheses: and explanations of the nature of the œconomy have been offered that to me seem quite at variance with the laws of the animal œconomy. The opinions held by Mr. Abernethy and Mr. John Bell I cannot adopt, however highly I appreciate their abi-

lities, and though I feel, in common with the profession, that they have done much to improve our knowledge of the subject.

#### DEFINITION OF TUMOUR.

MR. ABERNETHY defines tumours to be such swellings as arise from some new production which made no part of the original composition of the body. By this definition he conceives that he has excluded all simple enlargements of bones, joints, glands, &c. It appears to Mr. John Bell that every tumour is a mere accretion of nutritious particles, in skin, bone, gland, or muscle, according to the nature of the part: tumour is in short, says he, either an increased nutrition, or an increased secretion, modified in its form and character by inflammation and ulceration.

There has been no critical examination, surely no important objection offered to the definition of tumour, "*morbosum voluminis augmentum*," which I conceive to be scientific and correct. To define what is unnatural we ought to take into consideration what constitutes the natural state of the parts of the body.

There is an influence governing the growth, shape, and magnitude of the body, and of the individual parts of it: the changes from infancy to age are in a series: there is an uninterrupted progression. Before the seed is put into the ground the tendency of its growth to the utmost maturity of the plant is fixed. In animals, before the first pulsation of the *punctum saliens* is seen in the embryo, the actions of the system which lead to all the peculiarities in the mature animal, are fixed also. They follow in a natural course to perfection, in form, movement, and function. As the whole animal is, so are the parts, governed in their growth; the form of a finger is prescribed; the action of its vessels is under an influence which restrains the form and constitution. If the part is cut, it unites again; not by a "stimulus of necessity," nor by a "disposition of renovation:" there is no necessity for

using this unintelligible language if we will but acknowledge our ignorance. What governs the constitution of the part in health unites it by adhesion, or circumscribes the new formed granulations when it is cut, or injured, so that they rise to the surface, but no further. There is no necessity, nay, there is no foundation for supposing, that an alteration in structure, or in the action of the part, (further than in degree,) is necessary to its closing when cut, to its restoration when injured. When we reflect that every part in its natural state is continually changing, not for a day remaining actually the same in all its parts, but that absorption and deposition are going forward perpetually, while the external character and form, the internal structure and the very constitution of the part remain the same, need we seek for any other explanation of the healing and the restitution of a part injured than the continuance of the same uniform influence, the same action of vessels? A silent and imperceptible influence preserves the part during the necessary changes from youth to age; by violence this influence becomes apparent, which is owing to the demonstrable nature of its effects, not to the change of its action. We cannot judge of the action of vessels but by their effects; when we see that the tendency of increased action is to the restitution of the frame to its original and perfect state, we must consider the action as natural; as still influenced by the same principle which originally formed it, and by which, during a course of changes, it was preserved.

These considerations, I hope, will lead us to adhere to the definition of tumour given by other surgical pathologists. We shall be enabled to distinguish betwixt mere tumefaction and confirmed *tumour*, while, I hope, we shall be led to a rational principle of practice.

A swelling is a mere consequence of over-action in vessels where yet there is no change or modification; in this case the mere reduction of the strength and activity of the part will be followed by the reduction of the tumefaction.

A tumour, on the contrary, is a circumscribed swelling, with new modification of the structure\*, which arises in consequence of a specific action ; does not spontaneously disappear ; and will not subside by the mere subtraction of blood, or diminution of activity in the vessels. A tumour is often superadded to the natural body, but is constituted sometimes by the preternatural augmentation of a part ; for example, of a gland, in consequence of a specific change, and increased activity of the vessels of the part.

In illustration of what I have here delivered I venture to add this example : When a man breaks his leg I conceive it is healed, not by a new action, not by a stimulus of necessity, which implies the residence of an intelligent principle, but by the continuance of that uniform influence which brought it from cartilage to bone, which prescribed the form of the bone, which preserved its form whilst its particles were changing daily. Those operations we did not see : neither the destruction, nor the renovation of the parts ; but now we see the renovation because the destruction and injury were palpable ; and this, not from the change of action, but from the change of circumstances. When, however, the new bone is not level with the old, when it is different in structure and redundant,

\* On the term tumour, the following observations of Mr. Pearson are most pertinent : "Chirurgical writers have generally enumerated *tumour* as an essential symptom of the scirrhus ; and it is very true, that this disease is often accompanied with an increase of bulk in the part affected. From long and careful observation I am however induced to think, that an addition to the quantity of matter, is rather an accidental, than a necessary consequence, of the presence of this peculiar affection. When the breast is the seat of a scirrhus, the altered part is hard, perhaps unequal in its figure, and definite ; but these symptoms are not always connected with an actual increase in the dimensions of the breast : on the contrary, the true scirrhus is frequently accompanied with a contraction, and diminution of bulk, a retraction of the nipple, and a puckered state of the skin.

The irritation produced by an indurated substance lying in the breast, will very often cause a determination of blood to that organ, and a consequent enlargement of it ; but I consider this as an inflammatory state of the surrounding parts, excited by the scirrhus acting as a remote cause, and by no means essential to the original complaint.



there is something out of course and unnatural ; there is disease ; the vessels have not merely received an impulse of activity, but there is a new influence. If the diseased action should here build up a large protuberance, I call that *exostosis tumour*, though it be of the same blood and bone with the original part.

The changes which take place in the body are not so gross and palpable as to be manifest to our senses ; we can see no difference often in a mild ulcer, and in one which will be pregnant with mortal contagion. If we are to take only the grosser distinctions of matter as pointing out the difference betwixt tumour and swelling, we shall be in perpetual difficulty ; if an *exostosis* be no tumour because it is only the original matter, is an accumulation of flesh and bone a tumour ? or, is a large tumour, full of bone, and membranes, and vessels, and flesh, which grows amongst soft parts, to be considered as a proper tumour ? or, is it only a tumour when it contains grey matter, or something unlike what we see in the natural structure of the body ? If this last circumstance be taken as the true definition of tumour, then many circumscribed swellings of specific action, fatal from the tendency of that action, or the peculiarity of their place, which resist all known means of cure, and absolutely require the knife, are left still to be classed. Another important consideration in practice is, that the place and tendency of the action in the tumour being ascertained, the line of practice is clear ; but if our attention be drawn to the distinctions of internal structure only, to distinctions which have no corresponding outward sign to mark their existence in the living body, we are led from the rule of practice, and left without a guide.

Surely there is great imperfection in the very first step of Mr. Abernethy's classification ; his first genus being known from the tumour being composed of the coagulable part of the blood rendered very generally vascular. This vascular coagulable lymph is the fore-runner of all natural changes of the parts in health and vigour. So Mr. Hey, in describing the fungus hæmatodes remarks, that the origin of the tumour

must have been extravasated fluid become organized ; and then he asks, was it blood mixed with a large proportion of lymph ? neither the microscope, nor chemical analysis of the solid or fluid contents of tumours, will ever serve to point out the character which is to guide us in practice ; we must take into consideration the peculiarities, constitutional and local, and as far as we are able endeavour to recognize the external character, and study the course of the disease, as the most likely to make us acquainted with the peculiarity and tendency of the action. In this investigation we must often recur to the dissection of the tumour, and to the internal structure as our guide ; but the knowledge of the internal structure can be useful only as it directs our enquiries, or enables us to judge of the patient's danger by the outward sign.

I hope my reader will allow me to detain him from the practical part of this tract a little longer, in order that I may explain my opinion on the subject of tumours formed out of coagulated blood. The observations of Mr. Hunter on this subject being, as I think, the foundation of the common opinion, the following excerpt may be taken as explanatory of it :—

“ In the course of his experiments and observations, instituted with a view to establish a living principle in the blood, Mr. Hunter was naturally induced to attend to the phenomena which took place when that fluid was extravasated, whether in consequence of accidental violence, or other circumstances. The first change which took place he found to be coagulation : and the coagulum thus formed, if in contact with living parts, did not produce an irritation similar to extraneous matter, nor was it absorbed and taken back into the constitution, but, in many instances, preserved its living principle, and became vascular, receiving branches from the neighbouring blood-vessels for its support ; it afterwards underwent changes, rendering it similar to the parts to which it was attached, and which supplied it with nourishment.

“ In attending to cases of this kind, he found that where a coagulum adhered to a surface, which varied its position, adapting it to the motions of some other part; the attachment was necessarily diminished by the friction, rendering it in some instances pendulous, and in others breaking it off entirely. To illustrate this by an example, I shall mention an instance which occurred in the examination of a dead body. The cavity of the abdomen was opened, to examine the state of its contents, and there appeared lying upon the peritoneum a small portion of red blood, recently coagulated; this, upon examination, was found connected to the surface upon which it had been deposited, by an attachment half an inch long, and this neck had been formed before the coagulum had lost its red colour. This steeped in water so as to become white, appeared like a pendulous tumour.”

“ From this case it became easy to explain the mode in which those pendulous bodies are formed that sometimes occur attached to the inside of circumscribed cavities, and the principle being established, it became equally easy for Mr. Hunter to apply it under other circumstances, since it is evident from a known law in the animal œconomy, that extravasated blood, when rendered an organized part of the body, can assume the nature of the parts into which it is effused, and consequently the same coagulum which in the abdomen formed a soft tumour, when situated on a bone, or in the neighbourhood of bone, forms more commonly a hard one. The cartilages found in the knee joint, therefore, appeared to him to originate from a deposit of coagulated blood upon the end of one of the bones, which had acquired the nature of cartilage, and had afterwards been separated.”

Mr. Abernethy continues the subject in these words: “ had vessels shot through the slender neck, and organized the clot of blood, observed by Mr. Hunter, it would then have become a living part, it might have grown to an indefinite magnitude, and its nature and progress would probably have depended on the organization which it had assumed. I have in my possession a tumour, doubtless formed in the manner



Mr. Hunter has described, which hung pendulous from the front of the peritoneum, and in which the organization and consequent actions have been so far completed, that the body of the tumour has become a lump of fat whilst the neck is merely of a fibrous and vascular texture. There can be little doubt, but that tumours form every where in the same manner. The coagulable part of the blood being either accidentally effused, or deposited in consequence of disease, becomes afterwards an organized and living part, by the growth of the adjacent vessels and nerves into it. When the deposited substance has its attachment by a single thread, all its vascular supply must proceed through that part; but in other cases the vessels shoot into it irregularly at various parts of its surface. Thus an unorganized concrete becomes a living tumour, which has at first no perceptible peculiarity as to its nature; though it derives a supply of nourishment from the surrounding parts, it seems to live and grow by its own independent powers; and the future structure which it may acquire, seems to depend on the operation of its own vessels. When the organization of a gland becomes changed into that unnatural structure which is observable in tumours, it may be thought in some degree to contradict those observations: but in this case the substance of the gland is the matrix in which the tumour is formed."

When Mr. Hunter, Mr. Abernethy, Mr. Home, Mr. Hey, and Mr. John Bell, give up their time to the investigation of the nature of tumours, it is an injunction on me to do my utmost to satisfy my reader on the subject. Perhaps some of these gentlemen may feel contempt and indignation at the idea of controverting opinions so substantiated as these I have transcribed. But in a science so interesting, the assumption of superiority is a singular instance of inconsistency, and carries with it a most ridiculous air of folly. Whoever makes the philosophy of the living body his study may be taught humility, and from his own errors learn to look mildly on those of others.



I would have my reader to recollect the phenomena of the formation of bone, in cartilage, in membranes, or in that mass, which we are accustomed to call callus, around the ends of a broken bone; of the formation of new membranes; of the adhesion of the soft parts by an intermediate substance; as well as of the formation of tumours from coagulum, as it is imagined. And I intreat him not to attach himself entirely to a solitary fact, nor to give himself up implicitly to the guidance even of a Hunter, who, amidst all the splendor of his talents, was often unintelligible.

1. I think the leading error of this doctrine is the inattention to the distinction between the coagulum thrown out from the organized extremities, and that which is spilt as it were by the accidental rupture of a vessel. In the one instance it is a secretion; and in the other a mere extravasation, possessed of no power of reproduction; absorbed, if in a small quantity; a source of inflammation and suppuration, if in a great quantity. I must see the coagulum of blood thrown out in apoplexy, and in aneurism, full of vessels, before yielding up the conviction that the coagulum of blood accidentally thrown out is absorbed, and a new deposition secreted, previous to the formation of vessels.

2. It is matter of surprize to me, how the physiologists, who support the original observation of Mr. Hunter, can adhere with such devotion to the circumstance of this coagulum forming a connexion with the peritoneum obscurely imagined; when if the fact were so, viz. that coagulum of pure blood formed adhesion to that, or any other surface, and grew there, it would be as familiarly known to every surgeon, as it is demonstrable that extravasated blood is absorbed, and that a limb turgid with extravasated blood will resume its form.

3. We frequently have coagulum thrown out from inflamed surfaces with such a proportion of the colouring particles of the blood, as to appear like a pure coagulum of blood somewhat blanched; and I have no doubt the coagulum found by Mr. Hunter was of this nature. But while I believe that

the pure coagulum of blood escaped from the rupture of an artery, or a vein, has no power of adhesion, or of forming vessels within it, yet if circumstances should present themselves to convince me of my error, the following view of the subject would stand uncontroverted by that circumstance.

4. Every part having a peculiarity of structure, preserves that peculiarity by the prescribed modification in the activity of its vessels ; this modification is continued when the part is injured, or cut, and the renovated matter is consequently like the original substance. Violent injury will sometimes interrupt this natural renovation ; but on the subsiding of the violent commotion, and the return of the natural action, the part is reinstated. As, however, the functions, (and we may perhaps venture to say the structure,) of some parts of the body are more delicate and peculiar, these are not restored in all their pristine perfection, though always with such a relation to it as to show that the bond of union of the divided parts is not the same in all, but holds a relation to the original formation.

5. If a bone is broken, a coagulum is thrown out ; the vessels of the bone penetrate this coagulum, and the vessels of bone deposit bone. Such is the received explanation of the formation of new matter of bone, and a most imperfect one it is. This opinion does not at all correspond with the facts, which stand thus : The mass which we call callus, and which surrounds the broken ends of bones, is supplied with vessels principally from the surrounding soft parts, and yet bone is formed. If, therefore, the source from which the vessels chance to be derived influenced their action, muscle and membrane would be formed, instead of earthy matter deposited. The fact, as it has appeared to my eyes, is, that the original coagulum of blood, which is by the violence of the accident, and the rupture of vessels, thrown out around the extremities of the bone, is absorbed, and a new deposition is slowly secreted ; the source of that secretion is the bone, and bone is formed in that nidus, although the vessels supplying it with blood be from parts entirely different in structure and

use. The medium into which the vessels pass influence their activity, we might say, but I believe this is not the entire truth;—an artery does not bore and work its way into a coagulum as has been described. Some people's minds are easily satisfied! and when they think of the force of the circulation, they conceive it an evident and likely thing that the blood forces its way forward; that the arteries push out and enter this substance, without ever imagining it necessary to consider how veins, and lymphatics, and nerves make their way into this new matter. It appears to me, that this secreted coagulum in the very act of its formation receives its character; that its structure is already determined; that the tract of its vessels is laid; that the parts are in embryo; when blood is received, the previous determined structure influences the secretion to be drawn from it, as in all other instances.

Thus far we have been speaking of natural changes of renovation;—tumours are unhealthy superstructures. If tumour forms from coagulum, that coagulum is not the mere blood escaped from the vessels, but a coagulable part secreted by the vessels of the surface, under a peculiar influence in their action; and according to that action is the growth of the future tumour. Its character, the matter secreted into it, and the proper substance of it, depend on the original formation; in other words on the influence of the vessels which secreted the coagulum.

The following scheme of tumours, reduced under four heads, I hope will be found a suitable introduction to my observations on the manner of extirpating them.

## I.

ENCYSTED TUMOURS. (*Cystides.*)

WE must distinguish the term cyst from capsule, which latter I think ought to signify the condensation of the cellular substance round a solid tumour.

The incysted tumours consist of a cyst, the contents of which are secreted by its inner surface.

**HYDATIDES.** Delicate incysted tumours often gregate; and entangled in the cellular membrane.

The incysted tumours containing lymph, or serum, have been called *hygroma*.

Even here, in the first step of our inquiry, we are at a loss to mark the distinction betwixt tumours of the cellular membrane, and those transparent bags uniformly round and smooth, filled with clear water, and which have no adhesion, which are distinct animals: "they produce their like, and multiply." Although these animals cannot be considered as tumours, being themselves animals, yet they become a character of disease, since I imagine that there is a previous nidus for them in a change of vascular structure, or action. There is yet a third distinction under the head *hydatid*, more distinctly animals, the *tenia hydatiginea*. These I have found in the monkey, sheep, and hare. They adhere to the vascular membranes of the viscera, by a pendulous membranous sac, which has vessels branching on it; within this sac the hydatid is contained quite loose. Some of them in the same animal I have seen with one mouth, some with two, and others smooth without any, which led me to doubt whether these white corrugated projections on the sac were indeed the mouths of the animal. I have found a worm like the *tenia*, and these *tenia hydatiginea* floating loose in the abdomen of the same animal.

**GANGLION.** A solitary incysted tumour, connected with tendons, or ligaments.

**RANULA.** (See Diseases of the Mouth.) An incysted tumour under the tongue, or projecting on the inside of the cheek.



I would place here, under the head of incysted tumours, sacs containing fluid blood, such as I have seen about the throat.

Cysts containing matter dense, like these three last examples, have been called *lupia*.

- MELICERIS.** An incysted tumour, the matter being of the consistence of honey.
- ATHEROMA.** An incysted tumour, the matter contained being pultaceous.
- STEATOMA.** An incysted tumour, the contents of which are fatty, or like suet.

## II.

### GLANDULAR TUMOURS. (*Phymata\**).

#### 1. SCROPHULOUS TUMOURS.

2. **SARCOMA.** A tumour, to the feeling of the consistence of flesh.


Under this head we must place a very great variety of diseased enlargement of the glands, varying in the kind of glands they attack, in their outward character, in the celerity of their growth, in their termination, and in the appearance of their contents.

There will of course fall under this head several tumours of distinct glands : as,

- BRONCHOCELE.** Enlargement of the thyroid gland.
- SARCOCELE.** Fleishy tumour of the testicle, or cord.
3. **SCIRRHUS.** A hard, irregular, and indolent tumour of a gland. The knobby hardness of a tumour is, no doubt an alarming circumstance, but such indolent affections of the glands often appear in mature years, which prove unconquerable, and yet continue innocent to the latest period of life. When surgeons speak of the true and exquisite scirrhus they mean the carcinoma.

\* A tumour having its seat in a gland ; " born of itself," and proceeding from no evident injury.

4. **CARCINOMA.** A tumour of a gland, in a state of activity approaching to cancerous ulceration\*. The tumour is hard and unequal; there is a lancinating pain in it; the skin is purple, or livid red; and the cutaneous veins are enlarged.

 To the term **CANCER** we find the words *apertus* and *ocultus* joined; the first meaning the open ulceration; and the other, the sense I have given to *Carcinoma*. The spreading of varicose veins over the surface of the tumour being considered as a symptom of great malignity, was the reason of the term *cancer* being used; they conceived they saw a resemblance in the branching of the veins to the claws of the crab! A true cancer, arrived at ulceration, has the edge of the ulcer serrated, indurated, retorted; the erosions betwixt the excrescences are deep, and bleed from time to time; there is constant burning pain, and the discharge is sordid, sanious, and peculiar in its factor.

Internal parts and canals having a glandular structure, though not the outward form of glands, partake of the scirrhus and carcinoma. We have the disease in the œsophagus, in the stomach, in the rectum, &c.

5. **BRUO.** A hard, phlegmonous, swelling of a lymphatic gland, from disease received through the absorbent system; or symptomatic of acute and malignant constitutional derangement.

\* When a surgeon writes that his patient is strumous, the case is undetermined; but there are swelled glands with suspicion of scrophula. If he says, he has scirrhus tumours about the neck, I understand, somewhat indefinitely, that they are hard and knobby, and suspicious in their nature; but when he says, that they are carcinomatous, I imagine he has no doubt from the veins about them; from the hardness and lancinating pain, and increased inflammation, that they are cancerous, and of a fatal kind.

We are quite unable to distinguish accurately the characters of the tumours of which the glands are the nidus. There is a very great variety of them, proceeding from the changed disposition of the vascular action. We sometimes find a solitary tumour about the throat, which will at last inflame, and become active and cancerous. Another case will present, where with the same character, we see that the disposition spreads, and there are many glands diseased; and on occasions, that the disease is not confined to the lymphatic glands, but spreads to the salivary and thyroid glands. Sometimes we see a disease commencing in the glandular structure, propagated without seeming preference to parts of the same original structure with the gland; but involving skin, cellular membrane, and even muscle and bone, in a diseased assimilated action.

### III.

#### VARIX.

VARIX is a tumour of enlarged veins. When the vessels are distended, it is not in breadth only, but in length also; and to accommodate themselves they must necessarily be twisted. But neither *varix* nor *aneurism* ought to be considered as tumours, for there is no peculiarity of action amounting to disease; it is but at most a derangement of mechanism, the mere effect of pressure.

But as the derangement of the natural action always endangers the substitution of permanent disease, so in instances of mere distension of veins we find diseased action to be a consequence of it, as in the instance of *hæmorrhoids*, (tumours on the verge of the anus) which, though at first a mere distension of the veins and cellular membrane by blood, or lymph, become firm fleshy tumours. (*Marisca*.)

But it is of consequence we should particularly notice, that besides venous distension being a mere effect of the pressure of the blood; and besides, being a sign on the surface of solid tumours of virulence within; that there are tumours of varicose veins, distinct altogether in character from these, and which have a history so peculiar, that I deem it right to put them under a different head altogether. See *Hypersarcosis*.

## IV.

## EXCRESCENTIÆ.

**POLYPUS.** A pendulous tumour from a canal, or cavity.  
**CARTILAGINOUS TUMOURS** appended to the inner surface of the capsular ligaments of joints.

A question still remains to be decided ;— are the loose cartilages in the knee joint of the same origin with those attached to cartilaginous bodies ? If it is concluded that they are, and that they are excrescences of the natural cartilage, how do we account for bodies of the same kind being found loose in the vaginal coat of the testicle.

**VERUCA.** A warty, cutaneous excrescence.

**EXOSTOSIS.** The excrescence from a bone where there is no general enlargement.

**NODUS.** The thickening of the membranes which cover a bone ; it is often the same disease with the last.

**FUNGUS.** This term implies the soft excrescence from a surface ; as of a bone, or of the dura mater.

**NÆVUS.** (*Nævus maternus.*) A flat congenital excrescence of the skin. Sometimes rough and warty ; often with hair upon it ; of a purple, redish, blue, or black colour.

It is only in common language that we can call a corn, (*clavus*,) a tumour ; for it is a mere effect of pressure. There is no diseased action, but the continuation of a natural action ; an action of a kind in other circumstances to preserve the body. The accumulation of the layers of the cuticle on the palms of the hands and soles of the feet, as a consequence of use and pressure, is a happy provision for the protection of the parts beneath. But when pressure is on a point, there the accumulated cuticle acquires a hardness equal to horn, and bears hard on the soft parts beneath.



Under this head of *Excrecentiæ* there might be enumerated many terms which imply tumours of particular parts; as for example:

EPULIS. A tumour of the gums and alveoli.

PTERYGIUM, or PTERYGION. A thickening of the tunica conjunctiva.

ENCANTHIS. A tumour of the inner angle of the eye, in the seat of the caruncula lachrymalis.

STAPHYLOMA. A tumour of the cornea, &c.

## V.

THE DISEASED GROWTH OF A VASCULAR, FLESHY SUBSTANCE, INVOLVING THE PARTS PROMISCUOUSLY. (*Hypersarcosis*.)

Under this head I put such tumours as are of a fleshy consistence, and not distinctly of glandular origin, but which spread equally around.

FUNGUS HÆMATODES of Mr. Hey. This disease may take its origin in muscle, cellular membrane, or even bone. Sometimes it begins as a distinct tumour; sometimes as a general enlargement of the part; as of the leg, thigh, or shoulder; generally it is not painful. It is irregularly soft, (of uneven density,) and to the feeling there is a sensation of extravasated fluid, yet not of a fluid in a distinct sac. There is no irregular hardness; and no puckering of the skin. If it be seated under the fascia the distension has a considerable elasticity. The veins on the surface are much enlarged. In its progress the tumour bursts; and a soft, dark coloured, bloody excrescence rises from the centre, which bleeds freely, and reduces the patient's strength. The irritation, and the hæmorrhagy together, carry him off. When this tumour is opened in the life of the patient, the bleeding is profuse. When its contents are examined after extirpation, there is a greasy, ash coloured substance in the midst of a vascular bed.

ANEURISM BY ANASTOMOSIS of Mr. John Bell.—This tumour, for the most part, has its origin in the skin, but it in-

volves every living part in its progress. Its origin is often from those marks on children called *navi materni*; but sometimes, apparently from injury of the skin in the adult. The disease is, for the most part long stationary, when, without any apparent cause, the action of the vessels acquire vigour, the pulsation becomes perceptible, and the tumour sensibly increases. The colour of the tumour is a blackish blue or purple, and on the most prominent part there is an excrescence like a mulberry, which bleeds profusely from time to time. The substance of the tumour is cellular, and contains pure liquid blood. The blood can be pressed from it, and, to the feeling, the bags are soft and woolly. It destroys the patient by hæmorrhagy. When dissected it is like a mass of placenta.

This disease cannot be called an *aneurism*, which is a pulsating tumour of blood, from a mere injury of the machine, from a yielding of the coats of the arteries without any peculiar action. It is not a *varix*, which is a mere venous dilatation in consequence of an impeded return of the blood. In this tumour, on the contrary, there is a specific and very peculiar action, and nothing resembling either the impeded circulation of aneurism or varix.

ANOMALOUS TUMOUR.—Under this name, in various collections, we have both of the last mentioned cases; but besides such as correspond with these of Mr. Hey and Mr. John Bell, there still remain many tumours of the bones, muscles, and skin, which entirely differ from them, and which have had as yet no name given them. I have dissected a tumour of large size, which it was impossible to say resembled most the steatomatous tumour, or the vascular tumour described by Mr. John Bell, and in the substance of the tumour there were many cells full of liquid blood. These cells were not the irregular cavities of varicose vessels, but of a perfectly regular form, they had a smooth secreting surface. I would have called them hydatids but for their contents.

The nature of the OSTEO-STEATOMATOUS and OSTEO-SARCOMATOUS tumours is but little known; the first term implies

the growth of a steatome in the marrow of the bone, in which the bone enlarging becomes a shell to the fatty tumour, until perhaps the softer substance bursts through the bone\*. The term osteo-sarcomatous describes that softening and enlargement of a bone in which the tumour exhibits a mixture of soft and bony matter and softer fleshy substance. But the action of the vessels, the nature of these tumours, partakes of a great variety. Indeed the term STEATOM gives us an improper idea of the common fatty tumour of the body, which is a diseased accretion of fat nourished by vessels, and often without a cyst, or much to distinguish them from the common fat but their inordinate growth.

It is not in vindication of the imperfection of this sketch of a classification of tumours that I venture to throw out a doubt of a possibility of making a perfect catalogue and a description of them. Without boasting of how much I have seen, I may assert that I have seen a distracting multiplicity in the character of tumours. I have seen lately, and expect often to see, tumours which bear no accurate resemblance to such as I have seen before, or such as I find described. Tumours are not like animals, each proceeding from a stock, and bearing the mark of that origin. They are not like the diseases of the natural body, which, in similar circumstances is always similarly affected. But, to use the words of Mr. Abernethy, they are edifices which are built up by diseased actions, and in which these diseased actions reside. There is

\* In the greatest enlargement of a bone it often occurs, that what appears like an immense bone is but a shell. When the bony matter is absorbed on one side of a bone, we see it accumulated on the other; when wasting without, accumulated within! in short, when there are the most decided ravages of disease the bone is strangely disfigured, but still the mass of earthy matter remains nearly the same. In considering this disease of *osteo-steatoma*, or of the cases which I have seen, when the tumour of aneurism, and the formation of bone went on together; it appears, that the bony matter forms a shell as long as the original quantity of matter is not exhausted; at last, however, the growth of the original tumour becoming too large, the thin shell of bone is absorbed over the most prominent part of the tumour, and the tumour seems to burst through.

in this opinion much to ponder on and to admire. The matter in which the action resides, is the result of disease; the disease varies in its nature; the structure of that matter, so formed, slightly deviating, must affect the action residing in it; and that action having no doubt the character of all deviations from nature, viz. a less definite and circumscribed existence may be undoubtedly varied and modified. Thus it appears to me that new *diseases* are formed in many of the individual tumours, though they are not propagated: a correct general classification may no doubt be expected from careful observation, but I think it will ever be liable to derangement by the observation of individual cases.

#### OF THE TREATMENT OF TUMOURS.

*Of a swelled gland.* It is only by the continuance and obstinacy of a tumour in resisting remedies, that we know it to have such a peculiarity of action, as to afford little hopes of its resolving. In the beginning of every tumour, therefore, much the same practice may be pursued; and I shall state what is right to be done, under the idea that we still hope that it is merely a gland accidentally swelled; and where the diminution of the action may be followed by the decrease of size, and the restoration of its natural function.

When a patient comes to us with a swelled lymphatic gland we first consider the probability there is of its being in consequence of some irritation in the course of the absorbents; or we attend to the probability of its being scrophulous and constitutional. If we find it a solitary swelling of a lymphatic gland, for example, in the neck, we take into consideration its seat, and the course of the vessels; there is, perhaps, a scabby eruption about the roots of the hair, a gum-boil, ulcerated sore throat, discharge from the nose, &c. If there should not be one, but many glands swelled, and indurated, we must look to the age and constitution, and not commit the error of treating wholly as a local disease that which has its origin in the prevailing tendency of the system.



When a gland enlarges, leeches are to be applied, and the part frequently bathed with tepid water ; on the second and fourth day they are to be repeated ; and when the bites have healed a blister is applied with the best advantage. If, however, the gland shows itself to have much inflammation, a blister will aggravate and increase the swelling ; and even in cases where the gland seems indolent, it is necessary to secure a certain degree of weakness in the vascular action of the part, before any thing stimulating be applied to the surface. I am very partial to the use of vomits in discussing inflamed glands.

When glands enlarge from the action of cold in a scrophulous constitution, cold wet applications are to be avoided ; indeed, in that case it will be better to have recourse to warm fomentation of decoction of chamomile, and of sal ammoniac, or of salt and water, or of gentle and long-continued friction with the hand, or with stimulating oils. The part should be kept warm ; and if the above plan is found too troublesome to be employed, in the absence of affectionate care, a warm plaster of cummin-seed may be applied.

If we find that there is a concealed scrophulous action in the system, but that where the skin is exposed there chiefly the glands swell, it is most probable that the glands are suffering by sympathy with the skin ; which is the reason I recommend the plan of fomentation and friction ; but when the enlargement of a gland has no such origin, we may apply either cold solution of ammonia muriata, and cerussa acetata on cloths, or the blister, without deviating from the intention of diminishing the vascular action. The general explanation of the action of a blister is, that it excites the lymphatics, and consequently assists the absorption and diminution of the tumour. I imagine it is to be explained thus : if the blister be applied where there is a tendency to inflammatory action, the stimulus is propagated backward upon the trunk of the vessels brought into activity ; but if the power of re-action be previously subdued, then this irritation makes a revulsion from the deep parts, by bringing the blood which would otherwise pass to the deep parts to supply the superficial vessels ; what-

ever diminishes the activity of a swelled gland restores the balance to the absorbents, which were previously overpowered by the activity of the arteries; for it would not be difficult to prove that the lymphatics are less under occasional influence than the arterial system.

While we endeavour to reduce the activity of a swelled gland by direct means, we must prescribe purgative medicines twice a week, and enjoin an abstemious diet; temperance is of the utmost consequence where there is danger of a confirmed scirrhus. If the gland continues hard after this treatment, our next resource is an alterative treatment, by giving small doses of calomel, or corrosive sublimate. The extract of cicuta with calomel is a favourite remedy. Electricity is used, not as a counter irritation, but directly affecting the gland; it rouses its activity. We must be well aware of the mildness of the nature of a gland which we rouse to activity: no doubt, if there be no malignity in a gland, the rousing the vascular action may be productive of a change, and cause its final absorption; as it is sometimes observed, that a gland having been long indolent, swells, becomes painful, and then disappears.

It is a different expectation which makes the surgeon apply caustic to a tumour; he expects, that being of a mild, indolent nature, with little capacity of action in it, the life of the part, (being diseased), may be too weak for the violent operation of the caustic, so that the whole part may slough out. Such is the common effect of escharotics and caustics to a wart; the life of the excrescence is weaker than that of the natural parts on which it grows, and consequently while the application is too severe for the diseased action, the sound parts remain unhurt. But this is a dangerous practice in regard to scirrhus tumours; instead of destroying the disease, we may only rouse it to activity.

When a tumour is excited to virulence by corroding, or stimulating applications, it is doubted whether the latent malignity of the disease be merely roused, or a new action be produced; our most intelligent surgeons seem to think that

there is no such thing as the conversion of disease: Mr. Pearson expresses himself thus: "Writers have indeed said much about certain tumours changing their nature, and assuming a new character: but I strongly suspect, that the doctrine of the mutation of diseases into each other, stands upon a very uncertain foundation. Improper treatment may without doubt exasperate diseases, and render a complaint which appeared to be mild and tractable, dangerous or destructive; but to aggravate the symptoms, and to change the form of the disease, are things that ought not to be confounded. I do not affirm, that a breast which has been the seat of a mammary abscess, or a gland that has been affected by scrophula, may not become cancerous; for they might have suffered from this disease, had no previous complaint existed; but these morbid alterations generate no greater propensity to the cancer, than if the parts had always retained their natural condition." I cannot entirely agree with this opinion. I conceive that a part deprived of its natural action, is in a certain measure thrown out of the governance of the general œconomy, and is left a prey to irregular action, to disease. When a gland is injured by a blow, and the inflammation has gone high; if the natural structure and œconomy be deranged, permanent disease follows the subsiding of the mere inflammation. So we see that there is a period of life when the breast and womb become useless, and the influence of the system is no longer felt upon them; then disease fixes on them. I am not able to give any other explanation of the cancerous affections of the womb and mamma being so frequent at the turn of life. By pushing this discussion a little further I am led to conclude, that disease is not the effect of circumstance, and impression, but that there is a latent tendency to certain diseases, which take place in the absence of the controul of the healthy action.

*Of the extirpation of tumours by the knife.* Tumours of glands are cut out, as being likely to propagate a malignant disease; as apt to increase and press upon important places, as the eye, or throat; or lastly, from mere unseemliness.



Before we think of using the knife, we must consider well whether the tumour be simply scirrhus, or if it be of the nature of a carcinoma; or whether a capsule has been formed which marks the limit of the diseased action, or the surrounding parts be imperceptibly assimilated into the disease. In carcinoma, Mr. Hunter observed a disposition in the surrounding parts prior to the actual occurrence of disease in them. This remark, says Mr. Abernethy, is ratified by daily experience, and has led to the following rule of practice; that a surgeon ought not to be contented with removing merely the indurated, or actually diseased part, but that he should take away some portion of the surrounding substance. The simpler statement I fancy to be, that long before the eye can discover diseased texture in the substance, the action is propagated which must necessarily precede this effect.

However that may be, it is particularly necessary to examine the edges of a tumour which has been cut out, and to see that there is none of the peculiar texture of the tumour terminating abruptly on the edge, as if cut through. For example, the character of carcinoma, as exhibited on dissection, is in the condensed cellular membrane, which has a very peculiar appearance of irregular diverging streaks of a whiter colour, in the darker substance of the tumour; now if these membranous bands have reached into the cellular texture which has been left after the tumour is cut off, the disease will inevitably return, and grow with a rapid progress. The tumour is, therefore, to be held in reference to the wound, and where these bands are found to terminate abruptly, or where in the tumour there are any hardness and irregularity, or pulpy matter, or substance which does not appear of the natural texture, the corresponding part of the wound is to be examined, and the remaining disease extirpated. We must ever remember, that if tumours possessing malignity are only partially extirpated, they resent the injury offered to them, and resume a worse aspect than before.

If we are to operate on a tumour which has its seat in a gland, and if it be a mere scirrhus, there is a circumstance, which if du-



ly attended to, will greatly facilitate its extirpation; whilst the body of the gland is hardening, the surrounding membrane is condensed. The pressure, and probably the slight inflammation, forms the cellular membrane into a distinct capsule. By bearing in mind that these hard scirrhus tumours are surrounded by a membrane, we are enabled to cut out a tumour from a seeming dangerous depth.

I shall suppose that a patient comes to my reader with a hard tumour under the angle of the jaw, and which threatens to push towards the throat. The surgeon calculates the place of the arteries. He presses the root of the veins, and when they swell, he sees which are in his way. He then moves the tumour to ascertain whether its roots be deep, or if it has any firm adhesion; in doing this, he relaxes the muscles, and especially the platysma myoides.

If the tumour has not encroached on the great vessels too much, if it has not adhered, and communicated its bad influence to the surrounding parts, it may be extirpated. But my experience prompts me to say here, in the most confident manner, that if the tumour be not sufficiently free in its attachments, but on the contrary, has pushed deep, and taken attachment to the jaw, or transverse processes of the cervical vertebræ, no good will come of the operation. The patient after suffering considerable risk, and being the subject of a most painful operation, will have the mortification of finding the part grow hard soon after the cicatrization, and increase in its growth with a rapidity, which the progress of the tumour before the operation shall not have led him to expect.

If it shall be determined to attempt the extirpation of an indurated and scirrhus gland, the surgeon has to provide himself with knives, and a strong hook, and a blunt hook for the assistant, with tenacula, and needles; but above all, with pieces of sponge having ligatures attached to them; and with adhesive straps, and a graduated compress and bandage.

He begins his operation by cutting so that the fibres of the platysma myoides are cut across. To do this, it is not necessary that he carries the incision across the neck, for in that case he would open veins needlessly; but I mean to warn the young surgeon against cutting betwixt two of the fasciculi of the fibres of that muscle by which he will find himself restrained, in a most distressing manner, in the prosecution of the dissection around the base of the tumour. The first incision being made through the skin, I have seen the operator begin his sweeping cuts round the tumour, forgetful of the cutaneous muscle of the neck; and forgetful too of that essential circumstance, that the gland is now surrounded with a proper capsule.

If he begins to dissect round the gland before he has cut down to it, he will find himself in much confusion; and vessels bleeding in the progress of his operation which ought not to have been cut. He has therefore to lay back this cutaneous muscle freely, and then he will find himself rewarded for his decision by the gland starting more forward, and becoming, in fact, more superficial.

But still he has not exposed the proper surface of the gland; if he cuts perpendicularly on the cellular coat which covers the tumour, he discovers that this cellular substance is a loose capsule, from which the gland can almost be turned out with the point of the thumb! with the handle of the knife he separates the capsule from the gland:—he finds a part where there is more resistance; a stronger union betwixt the gland and capsule by a cellular cord; in this he will find the principal artery which supplies the tumour; and when he cuts this tag across, he must be prepared to take up the vessel with the tenaculum.

In our dissections, every day we see, that the lymphatic glands have one principal ramification of a neighbouring artery running into their substance. It is this same artery, which by its activity enlarges the gland; and this artery, for the most part, is all a surgeon has to take up in the extirpation of the gland.

If the operator is ignorant of this way of forcing the diseased gland from its capsule, or has to operate upon a tumour which has no such capsule, his dissection is more tedious and difficult ; and much more blood must be lost. If I am certain that a gland has this capsule, I care not how deep it may be seated ; I know that I can extract it ; but if it be of a different nature, and assimilated to the surrounding substance, I am unwilling to attack it, because I have no guide to show me the extent of the disease ; and because it happens, that at every touch of the knife a vessel bleeds.

If we have to extirpate a tumour of the nature of a bleeding fungus, like that described by Mr. Hey, or Mr. John Bell, we shall find no capsule formed by the condensed cellular substance. We must look well to the extent of the disease before we begin the operation ; for it is not likely that we shall be able to mark the extent of the diseased substance during the operation ; we must here too be aware that the disease does sometimes extend further than the diseased appearance, and we must therefore cut freely away the surrounding parts if it be possible or safe. Where the smallest speck of tortuous vessels of the skin remains behind after the amputation of that tumour called aneurism by anastomosis, the tumour is quickly re-produced with an increased exuberance. If the tumour has been seated in the neighbourhood of a bone and has fixed upon it, though there be no appearance of disease in the bone apparent during the operation, yet from that source will the disease be re-produced and propagated.

I have so often seen bloody and painful operations performed on these tumours without any good finally resulting from it, that I beg of my reader not to undertake the extirpation of them unless he be resolved at all hazards to take all away that is tainted with the disease.

In operating on these vascular tumours we must keep wide of their confines for another reason, to avoid blood, and the confusion resulting from it. If an adventurous young surgeon cuts into the body of a tumour of tortuous veins and



arteries, he has vessels throwing out their blood over both his shoulders, and his attempts to tie these vessels are quite unavailing. But if he keeps wide of the diseased mass he makes his dissection in the common cellular membrane, and perhaps only cuts across one artery which throws out its blood with no uncommon velocity, although sufficient to supply vessels with blood much more active than itself. I shall not stop to reason on this but state it as a fact worthy of the surgeon's attention.

In operating on sacculated tumours, as we have understood that the sac is the source of the secreted contents, it is evident that we must cut out the sac altogether, or we shall not eradicate the disease. If there be room enough, incysted tumours ought to be cut out entire. It may happen, however, that they are situated in the orbit, and pressing on the eyeball, in which case after the integuments are dissected, as the knife cannot be pushed by the side of the tumour, let it be punctured, which will give us room to proceed.

The atheromatous tumours will sometimes burst of themselves and discharge their contents, and heal. This circumstance may tempt the surgeon, on some occasion, to puncture and press out the fluid from these tumours, and perhaps it may happen that after this only a fluid like the original matter of the cyst be discharged from time to time; but the greater probability is that an irritable fungus rises from the opening. So we shall find that an imperfect operation on one of these wens, where a part of the cyst is left, is followed by inflammation, when if the disease had been extirpated the inflammation would have quickly subsided.

These incysted tumours are cut off for the most part on account of their size merely, but they do sometimes burst and push out a fungus, and become a source of irritation and erysipelatous inflammation; nay, the erysipelatous inflammation from such a source has spread and sloughed, and the derangement of the constitution been such as to destroy the patient: on this account therefore are they to be extirpated. I may here notice further that if we find that a fungus tu-



mour has arisen from a wen or incysted tumour, it is an encouragement to operate upon it. We hope that the deeper part of the tumour is still separated from the surrounding parts by the remaining cyst, and prevented from incorporating with them\*.

An incysted tumour may be so situated that it cannot be cut out, and yet something must be done to free the neighbouring parts from the pressure of it. I do not speak of the incysted tumours, the atheroma and steatoma, but of such sacs of fluid as we may see about the tongue and throat, and which are imagined, but without any very direct proof, to be salivary tumours. These cysts ought to be freely opened. When punctured they inflame and thicken, and yet do not close altogether; even the seton does not obliterate their cavities, and when they are inflamed and yet are not obliterated, the sac thickens and becomes itself like a tumour.

In my scheme of tumours I have mentioned under the head of incysted tumours, those containing *blood*. It is not always possible to distinguish these tumours of blood from such as have a proper secretion within the cyst, yet when they have no stool or firm sac, when by continued pressure we can empty them in a considerable degree, I am inclined to conclude that there is fluid blood contained in the tumour. These tumours are soft, colourless, and as I have said compressible, and have no pulsation, and are very slow in their growth.

These tumours soft, compressible, and without discolouration, I have seen on the side of the neck. I have contemplated the dismay of a surgeon on opening such a tumour with the lancet, when he found pure blood flowing from a tumour over the carotid artery! But there is nothing alarming in it; they can be compressed.

The practice I would recommend in such a case, were it again to occur to me, is, after you have proved that you can command the blood from one puncture, to puncture and ex-

\* See Mr. Abernethy's Treatise.

press the blood, and puncture it again and again in several places, then use compression. It may naturally be asked, why puncture to discharge the blood when it can be pressed from the tumour without this? I propose puncturing not to discharge the blood, but to let it escape from the cells in which it is contained into the common cellular membrane, and to inflame the tumour, by which alone we can expect the consolidation of it, and the destruction of this cellular structure which receives and gives out the blood.

I hope I need not again put my reader on his guard, to warn him against such interference as I here recommend in cases of such vascular and bloody tumours as are described under the term aneurism by anastomosis, or tumours of blood where there is pulsation or discoloured skin, or tortuous veins.

On this last subject of tumours of the skin with discolouration and tortuous veins, I have just to mention, that when at any time they shew a disposition to greater activity, by a wet bandage, by keeping a spongy cloth perpetually wet over them, their tendency to increase may be checked.

*Of a tumour forming in a nerve.* I have given a plate of a tumour in a nerve, which by the continued pain it gave wore out the patient's health and destroyed him at last. I know not whether to consider this as a tumour of the nerve properly, or only as a diseased growth in the interstice of the nervous filaments. However that may be, I consider it as very necessary to call my reader's attention to the symptoms of this disease, and further to intreat him to attend to the course and affections of the nerves somewhat more than is usual, being convinced that by this he may be able to detect the nature or seat of disease when otherwise it will be impossible. It was but the other evening that a gentleman complained to me of a pain and numbness of the back of the thumb and forefinger, this I found referable to a disease of the elbow joint, and an affection of the muscular spinal nerve. I visited a woman with a disease of the womb, who complained of an unusual pain and frequent spasms of the legs, I imagined that the disease had involved the sacro ischiatic nerve, and found

it so on dissection; in the same manner, I have found suppuration near the thyroid hole of the pelvis, attended with pain on the inside of the thigh and knee. So we ascertain the seat of disease to be in the loins from the numbness of the thigh, and retraction of the testicle; and further from the knowledge of the peculiar nature of the pain from the injury of a nerve, I have been able to ascertain that a disease of the arm did not proceed from the injury of the nerve, when others thought it so evident that they sought to cut the nerve across. In wounds too we shall often be able to ascertain the precise track of the ball, and the very artery wounded, by attending to the loss of sense of certain parts. If a ball has made its track through the axilla I consult the sensation of the finger and arm, to tell me where it has passed; and so indeed of the wounds of the pelvis, something definite may be learned when we find that parts are rendered insensible which are supplied by the anterior, middle, or great posterior nerve.

If my reader asks how such a representation of the necessity of attending to the distribution of the nerves comes into this place, my apology is in the following case, which drew my attention to the subject:—

About three years before I saw the subject of the following case; he had fallen from the side of a ship. It happened in this way:—Seeing his fellow-workman falling, he threw himself forward to break his fall, and succeeded; but in doing this, he fell himself; for he was caught by the ham on a projecting bolt in the side of the ship, over which he turned, and hung suspended. He suffered much from the bruise on the back of the thigh, but in a short time it got entirely well.

Some time after this, he began to be much troubled with a pain in his foot. This pain was in a part not likely to procure him much sympathy, and he suffered much and long without attempting to procure assistance, or only such as the extremity of pain will put a man upon for the time.

But the pain continued to increase from day to day, until it totally unfitted him for labour, exhausting and wasting his

frame by continued watching. This pain was of a peculiar kind—it was confined to the bottom of the foot and was like an intense burning, while there was not the slightest discolouration or swelling in the place. Often he would rise at night from his bed and stand on the cold stones, or plunge his foot into warm water or cold water, or into both alternately.

He now sought relief in a public hospital, and the attendants there disconcerted with the strangeness of the symptom, which they did not comprehend, put him, as is usual on such occasions, on a course of mercury; but this trial of a medicine did no good, and he went home. But still suffering continually, he was induced after a lapse of some months to return to the hospital, and was again put on a more severe and a longer continued course of mercury than at first. By the time this was over he had suffered continually for two years, and was reduced to a skeleton, and he was far gone in hectic.

When I saw him, he gave me this account, and then continued to complain of the extreme pain in the sole of his foot. He told me too that he had a strange numbness of the leg when he sat down. On examining into this circumstance, which I thought would lead to some explanation of the more prominent symptom, I found a tumour in the ham, which when pressed gave no particular pain, but rather a sense of prickling numbness down the leg. The tumour was to the feeling of a bony hardness. I conjectured that there was some tumour pressing and wedging upon the popliteal nerve, and that this injury to the nerve in its course was referable by the patient's feelings to the extremity and final distribution of the nerve. I thought of an operation, yet I was deterred from it by the dying state of the poor man, who now suffered but indirectly from the disease of the leg, and in all probability death was no longer to be avoided by the removal of the original cause. I thought that he might be brought round to have some strength, but within the week he died.



DISSECTION. On dissecting the limb I found a tumour under the fascia and about three inches higher than the usual place of the popliteal aneurism. I found some nerves running over it of a remarkably pure whiteness. On tracing the sacro-ischiatic nerve I found it enter into the substance of the tumour; but on more careful observation, I found that the Peroneal or Fibular nerve, though close on the tumour, yet was not incorporated with it; but that the tibial nerve, as is expressed in the plate, was incorporated with the tumour. On making a section of the tumour, it had much the appearance of a large ganglion on the tibial nerve; the fasciculi of the nerve could be traced but a little way into its substance, and in the interstices of the fasciculated bands a vascular fatty substance could be observed, which resembled marrow.

I think it is impossible to mistake the nature of this case. I have no doubt that the injury received on the ham was the cause of the disease in the nerve. This however might be a mere coincidence. Yet I think we cannot close our eyes to this striking proof of the affection of a nerve in its course being referable to its extremity. Had the nature of this disease been understood earlier, I have little doubt that cutting across the portion of the popliteal nerve which forms the tibial nerve, or the total extirpation of the tumour would have been succeeded by the perfect relief and recovery of the patient.



*Section of a cancerous eye representing the appearance of membraneous bands peculiar to this diseased structure. A, the centre and origin of the disease. B, the seat of the humours now occupied by the diseased mass. C, the lens converted into a solid concrete. D, the coats of the eye terminating abruptly where they have been destroyed by the progress of the disease. E, the bands which have destroyed the coats of the eye in their progress, and have struck into the eye itself.*

## CHAPTER X.

RULES FOR TYING ARTERIES WHEN DIVIDED IN WOUNDS, AND  
A DESCRIPTION OF THE MANNER OF DISSECTING FOR THEM.

I AM aware that some may conceive that this chapter contains matter foreign to the nature of a system of surgery. I cannot agree with them: I write for my pupils in the first instance, and I know in what they are most apt to err. Although I take all possible care in my lectures to teach them a proper and manly way of studying the arteries, yet I find them deficient in this branch of surgical anatomy, without which their other knowledge is useless. I think I was the first who taught my pupils the anatomy of the arteries in partial views, cut down upon them, and endeavoured to shew them in their natural confusion, and as they are seen in operation. I have done this in the hope that my pupils might not be at a loss when they came to seek for bleeding arteries in the living body, as are those who have been taught the anatomy of the arteries on dried preparations, or at most shewn them on the injected subject, after the dissection of the parts. When I say I was the first who taught the arteries thus, I know not that it is done even now by others; but I am certain that the labours of men of the highest ability must be less useful than those of the most ordinary capacity, if the former continue to teach on dry preparations, whilst the latter take this method.

Young men are too apt to fancy that when they have got a knowledge of the circle of operations, they are fitted for situations in the navy and army; but the first battle in which they are engaged brings them to a mortifying conviction of their ignorance. There is another class of students who com-



mit a still greater error; they can tell the holes of the diaphragm, the muscles which surround the shoulder joint, the coats of the testicle, and what is contained in the capsule of Glisson, how many arteries there are in the body, where the os tincæ is situated, on what bone we stand, and what is the use of the urinary bladder!! &c. &c. yet it is not strange that being occupied in the learning of these things, they know not when or how to take up a bleeding artery\*.

I conceive that even the title of this chapter may be of some use, by informing those who seem willing to forget that such things are necessary to be done sometimes, by causing them to reflect that the very first occasion they may have to wet their hands in blood, may be to stop a hæmorrhage from the brachial or femoral artery. For young surgeons are often in situations which require decision and dexterity, when the older members are placed where business may be done with deliberation and the characteristic gravity of the profession.

#### CLASSIFICATION OF THE ARTERIES IN THE ORDER OF THEIR IMPORTANCE TO THE SURGEON.

##### CLASS I. *Arteries the wounds of which are necessarily fatal.*

The aorta, and pulmonic arteries—the arteria innominata—the coeliac—the superior and inferior mesenteric—the splenic—the emulgent—the common iliac, and the external and internal iliac arteries, and the common carotids near the aorta.

##### CLASS II. *Arteries from which the bleeding is fatal if the vessel be not immediately stopped.*

The carotid artery—the femoral artery—the axillary brachial arteries—the profunda femoris and popliteal artery.

\* It is gratifying to find, however, that the college of surgeons are desirous of discountenancing this disgraceful method of teaching by question, so contrary to the true spirit, and that when they discover the monotonous sound of this baby lesson, the candidate is brought to the full disclosure of his ignorance, by some pertinent question, directly regarding the knowledge of the dead body



CLASS III. *Arteries, the bleeding from which is profuse and dangerous, and which require the ligature.*

These are the arteries of the leg—the ulnar and radial arteries—the gluteal and ischiatic arteries—the sub-scapularis—the thyroid and lingual arteries, and the branches of the profunda femoris.

CLASS IV. *Arteries which require careful compression, and if that be not possible the ligature*—the internal pudic—the epigastric—the arteries in the sole of the foot and palm of the hand—the interosseous artery of the fore arm—the intercostal arteries—the temporal and fascial artery, and occipital arteries.

CLASS V. This is a class of arteries that can be troublesome only in cases of great weakness, or when they are in bones or fungous surfaces.

## I.

IF there be bleeding from the hand or foot, and the surgeon is called soon after the accident has happened, and before any clumsy attempts have been made to stem the bleeding, he may put down a piece of sponge into the wound, and then a graduated compress being applied, the vessel will be effectually closed. But if the blood has been driven from the mouth of the artery into the cellular membrane, and under the aponeurosis, the compress cannot be used with accuracy and effect; neither can the tenaculum be used, because the mouth of the artery is hid; and the needle cannot be used, because the mouth of the bleeding artery is amongst nerves and tendons. So it happens that a wound of a trifling artery in the hand or foot requires the ligature of an artery of greater size in the wrist or at the ankle.

My reader now enquires whether all wounds of the arteries of the foot and hand require a ligature? Certainly not. I have seen the hand pierced and shattered in all directions by balls, and no ligature required. I have seen in the same

day three gun-shot wounds through the palm of the hand, without hæmorrhage, or more than was to be wished for.

In the use of a compress, this is not enough considered—that inflammation as well as pressure is required to the obliteration of an artery. If there be a considerable thickness of cellular membrane, or a fascia, betwixt the lint or sponge and the artery, the pressure may very likely fail, whereas if the compress had been put down in contact with the artery it would surely have succeeded; for then the pressure not only keeps the sides of the vessel together, but the contact of the foreign body causes inflammation and adhesion.

It will accordingly happen that the ulnar artery being wounded where it forms the arch in the palm of the hand, we shall in vain try to compress it; because the cellular membrane is charged with extravasated blood, and the artery has shrunk under the aponeurosis: the compress does not touch the artery and there is a great thickness of a substance like placenta over it. On another occasion finding an open wound, and the artery displayed, and no such driving of the blood into the palm of the hand, and no such general swelling as in the last instance, the compress being put down into the wound and the hand bound over a ball of cotton or lint, the hæmorrhage will be effectually suppressed.

## II.

It is more difficult to say what size of an artery requires a ligature than may be at first imagined. It is very likely that while I am describing the manner of cutting down upon the arteries of the third class, the tibial or fibular, or ulnar arteries, a naval surgeon may say, “all this is superfluous, for I have stopt these arteries by compression.” I have to shew that I know this, and yet that I deem it sometimes necessary to take up these vessels with the needle.

John Roe was shot in the arm and in the breast. He stood with the tackle in his hand ready to help in running out the gun, when a shower of grape-shot shattered the men at the

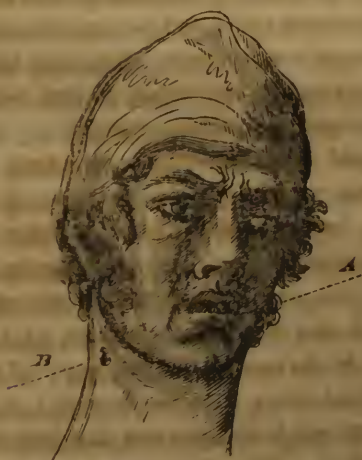
gun, killed two and wounded four. Roe felt his breath gone, and was sensible of a shot in his breast. The shot had passed through his arm, breaking the ulna above the middle, and wounding the ulnar artery; it then passed obliquely over the scrobiculus cordis, very critically passing betwixt the muscles and skin. Although there were circumstances in that wound of the breast that might be interesting, yet it is to the wound of the artery only that I have at present to call my reader's attention. The finger could be put into the wound by which the ball entered, as well as that by which it passed out of the fore arm. These wounds were filled with lint, compresses laid on each, and a tight roller applied. There was at first no pain; very little even when the surgeon thrust his finger deep into the wound; but in half an hour the patient felt the bandage tight, and became sensible of the cramming of the wound and soreness. The shot holes were black at the second dressing; the dossils of lint were drawn out, but he had no recurrence of hæmorrhagy.

It may be said that there was no absolute proof that the ulnar artery was wounded in this instance: in my opinion it was complete; but there can be no cavil about the following instance. M'Kenzie was on the covering party, on the retreat from Villa Franca, and while reloading his piece he saw a sharp-shooter of the enemy take his aim at him; the ball struck him in the fore arm; for the space of three miles of the retreat he bled freely from the wound, but on finding the surgeon the arm was bound up and the bleeding was stopt and did not return. When I looked on this man's arm some days after, I was assured that the ulnar artery was in the direct course of the ball, and that it must have been cut through: the ulna was shattered, and many loose pieces lay in the bottom of the wound. I was confirmed in my supposition of the artery being divided, by the unusual irritation and pain in the wound, which I attributed to the ulnar nerve being cut across, and now engaged in the fungous and ill-conditioned sore. The arm was amputated: the propriety of the operation turning on other circumstances than what is to my pre-



sent purpose. When I examined the part in dissection, I found the ulnar artery and nerve cut across, and on introducing the probe into the artery, I found it stopt for the length of an inch and a half, in part owing to the contraction of the artery, but principally from the adhesion through coagulable lymph.

I could give other cases of wounds which I have seen of the ulnar and radial arteries thus easily stopt by compression; but what I have said is sufficiently conclusive on this point, viz. that where these arteries are divided by gun-shot, compression is sufficient to stem the blood. I give here a sketch of a wound of the lingual artery, which being of the second order of arteries also, is I think conclusive on this head.



*A, Ball entered. B, Passed out.*

The ball shattered the angle of the jaw, passed obliquely through the tongue, and came out by the edge of the mastoid muscle of the other side. This wound bled for half an hour and then stopped. I judge that the lingual artery was wounded here, first from the course of the ball, as apparent to the eye; but also from this circumstance, to which I was careful to attend, viz. the insensibility of the left side of the tongue, which implied that the nerve was cut.



## III.

THE next inquiry which the intelligent young surgeon would naturally make, respects the necessity of tying arteries of the third class, when wounded by a splinter or by a knife. The first question is not so easily answered as the second; let us for example take the following case:—In Lord Duncan's victory John Niel was stationed at a gun, when a shot struck a bulk-head, and drove it in splinters, so as to throw down and wound all the men at the gun; Niel was cut about the breast and throat with splinters, but not deeply. He went to the next gun and wrought at it; when as he carried a forty-two pound shot betwixt his hands, a shot passed through the ship, and a very large splinter struck his arm and made him quit his hold. While he was looking at his arm two men were dashed against him, and all three tumbled down the hatchway. Niel was much sprained and bruised in the back by his fall\*. When he could, he crawled into the cockpit, and found his arm bleeding very profusely. There were two wounds on the outside of the elbow joint, through the belly of the supinator muscle. In one of them a large splinter was sticking; which Niel, while he waited his turn to be dressed, endeavoured to pull away but could not. It was from this wound the bleeding proceeded: it was like a ball wound, and admitted the point of the finger, and was very deep. When the firing ceased the surgeon set this poor fellow in a great chair, while he took his arm and tugged at the great splinter ineffectually. He therefore, at last, cut the wound open on one side, so as to free it, and it came out easily. If he had carried his knife into the other wound, which was close by it, he would have done good, for it afterwards appeared that there were many splinters in it, buried deep in

\* The reason I transcribe these circumstances is to bring my reader acquainted with the very different kind of wounds aboard ship, from those to which the soldier is exposed from grape and musket shot. The case was communicated to me by my brother.

the flesh, though not to be felt with the finger when it was pushed deep into the wound. Both wounds now bled profusely; the surgeon crammed them with flour, and laid a compress and a tight bandage over them. During two nights and two days the bleeding was so profuse as to indicate a wound of the ulnar artery; but partly because the bleeding was in some degree commanded by the compresses, and partly from want of assistance, the surgeon did not undo the bandage. Niel was by this bleeding reduced very low. When the bandages were undone on the third day the bleeding had stopped.

In this case we have a wound in the same arteries, but in circumstances materially different. The splinter of wood, although driven with the force of a bullet, yet wedged and cut its way no doubt; and while a ball, being round and obtuse, bruises as it passes, this splinter cut the artery. The bleeding was however stopped; but if the artery had been cut by a knife, it might have been more difficult: to shew which, I subjoin the following note of a case of wound of the radial artery, proving that a man may die from it:—

#### IV.

A GENTLEMAN was wounded in the fore arm by a pistol-shot. The arm swelled prodigiously; abscesses formed in the fore arm; and it was thought necessary to open them freely, and to rip up the fascia: in doing this, unfortunately, the radial artery was touched. The bleeding was profuse; and from the weakness of the patient, critical: my reader may conceive from what has been described, that nothing would be so easy as to compress this artery; but let him consider things as he will find them in practice. The man's arm is swoln to half the size of the body; great abscesses are in it; it is inflamed and so painful, that a heavy foot in the room, or the lifting of the thumb of the patient, gives excruciating pain. It is evident that the wound cannot be effectually stuffed and compressed when in this state.

I know not on what grounds the surgeon determined in the preceding instance, but he took up the humeral artery, and not the radial artery. Still the bleeding continued. This put my notions of the effect of ligature into strange perplexity. Still the patient bled, and what could be further done?—and in a short time he died. On dissection, I found the radial nerve with a firm ligature around it, but the humeral artery was not included. I never had seen the radial nerve mistaken for the humeral artery, but this was the third time I had found the radial nerve with a ligature around it.

This is a pure case of a division of the radial artery, by the knife, proving fatal; and these cases leave no room for conjecture on the difference between gun-shot wounds, those by splinters, and the clean cut of a knife. It is in this latter case especially that we have to cut down upon the artery and take it up.

## V.

I HAVE stated that the branches of the profunda femoris require the ligature; but from the difficulty of the dissection, the uncertainty in regard to the branch which bleeds, and the precise place of it, we shall be long held in suspense, and perhaps obliged to trust to compression. In gun-shot wounds the case is still more perplexing.



In this slight sketch I have represented the place of the wound of J. Chambers, of the rifle corps. He was wounded in the retreat at Villa Franca; the ball entered under the edge of the sartorius muscle, passed obliquely through the flesh of the thigh, and round the bone, and lay under the skin near the trochanter major. The wound bled freely on his first receiving the shot. He was thrown on a mule, and for three leagues on the retreat he continued to bleed. The surgeon cut out the ball, and bound up the limb, and then the bleeding stopt; but it broke out again, and continued to bleed for ten days; and after this, when aboard the transport, there was great bleeding, so that they were obliged to apply the tourniquet, &c. The wound continued to bleed till within two days of his coming ashore.

A wound of the femoral artery would have prevented him from ever rising from where he fell. This has been a wound of the branch of the profunda, which descends before the insertion of the long head of the triceps, and which is behind the great artery; yet although a branch, it is as large as the brachial artery, and its importance is shown by its continuing to bleed for thirteen days,—from its requiring the tourniquet eleven days after the wound was received. This artery, however, was at last stopped by the compress and roller—but had it been cut with a knife the bleeding would most probably have been fatal, if the artery had been left unsecured.

## VI.

It will not be denied, (though I know not where the important fact will be found distinctly stated), that it is not the size of the artery which makes it to be dreaded, but its comparative size; and this not in comparison with the size and years of the patient only, but its principal importance hangs on the question whether—is it the main artery of a limb, or a branch? From a branch of the profunda, equal to the brachial artery in size, the man is less likely to bleed to death, than if the wound is in the brachial artery.



## VII.

IF a man is wounded in the main artery of the thigh, or arm, from the weapon entering in at the outside of the limb, it must be evident that the original wound cannot be enlarged to seek the artery, as has been proposed. To take the most favourable case for this proposal, I say, that if a man be wounded through the flesh of the triceps, and the sword pass into the humeral artery, we cannot dilate the wound to expose the puncture of the vessel. We must pass the gun-shot probe into the wound, and pass it forward until we can feel its point on the skin on the inside of the arm, and near the artery. Here we cut upon the artery, and make sure that this incision communicates with the original wound; and if we do this, there can be no embarrassment from the artery continuing to bleed by the wound towards the outside, while we are dissecting for the artery on the inside of the arm.

If in searching for the wound of an artery the blood does not flow, although you are sure that the side of vessels is wounded, compress the artery below the supposed place of the wound, and the blood will start out.

## VIII.

WHEN we cut down upon the artery of a limb, and having found it, are about to separate the vein and nerve from the artery, we must bend and relax the limb; by inattention to this rule I have seen the radial nerve twice included in the ligature put around the brachial artery.

## IX.

IT does not appear to me that surgeons have determined whether a single, or a double ligature be required in case of a wounded artery. I am sure that some may entertain these

difficulties: viz. whether in certain cases a ligature being put around the artery above the wound, the patient is quite secure? or if it be not necessary to tie the lower part of the artery also? On this subject I shall state what appears to me to be the fact, and endeavour to draw the safe rule of practice.

While these papers are before me my assistant is called to take up the radial artery, where it has turned from the fore part of the wrist. He finds a man with a deep wound of a knife betwixt the fore-finger and thumb: the man has already lost much blood; and introducing the probe it is found, that the point of the probe is at the head of the metacarpal bone of the thumb. The artery is taken up by the side of the extensor tendons of the thumb. The bleeding is stopped, yet in a short time the blood flows again; but the wound being tied up, with a compress laid in the course of the wound, all is well. When a man is bleeding from the hand, or wrist, or foot, tying the artery only diminishes the impulse of the blood, and does not entirely stop the flow of blood which comes round by the very free inosculations.— But the direct course of the blood being interrupted, our dressing is sufficient to stem the force of the hæmorrhagy by the anastomosing vessel; if the artery be not taken up, a sponge must be thrust deep into the wound, and a tedious sore is the consequence; but if the main supply be stopped, the lips of the wound can be brought together, and the compress put over the integuments, (not into the flesh), and the wound healed by the first intention.

If the surgeon be brought to a man who has received a wound in the inside of the arm, and he has reason to suppose, from the dashing of the blood, that the humeral artery is wounded, ought he to be satisfied with pulling out something from the bloody wound, and tying it? nay, even supposing that he distinctly sees the extremity of the artery, and the blood flowing from it, is it sufficient to tie that mouth of the artery? I believe, that with common care afterward, and due compression, the patient will not die of hæmorrha-

gy; but I am at the same time convinced, that when the principal artery of a limb is thus severed, or wounded, a ligature ought to be applied both above and below the wound; and then only can the limb be left free of bandages and compresses, which in this case is especially necessary. These bandages not only prevent the early union of the cut, which is a minor consideration, but they do not allow the free circulation through the limb by the collateral arteries, now that the main trunk is cut and tied. When the main artery of a limb is tied we expect the free course of the blood by the anastomosing branches still to supply the lower part of the limb; and surely, when we are so confident of this expectation, we cannot doubt the propriety of tying the artery both above and below the wound, so that there may be no fear of hæmorrhagy from the returning blood, and no necessity for a compress to be put into the wound.

## X.

A QUESTION may still remain with my reader in the case of a wound of the fore arm, or leg, when the ball has torn both arteries what is to be done? I take particular pleasure in producing the following case, presented me by Mr. Torbit, of the Crescent, formerly a pupil of mine.

### A CASE OF DIFFUSED ANEURISM WHICH HAPPENED AT THE SIEGE OF DANTZIC, MAY THE THIRD, 1807.

A POLISH pilot was offered a pecuniary reward, from the British Consul, to carry dispatches from General Kalkruth, commanding the garrison of Dantzic, to General Kaminski, commanding the allied Russo-Prussian army in the Fair Water. On his passage in an open boat down the Vistula, he was fired at by the French sentinels from both banks of the river, and received a wound from a musket ball, which entered the left arm from without, about two inches below the elbow joint, the ball made its exit at the lower end of

the ulna, carrying away both radial and ulnar arteries. A profuse hæmorrhage followed, but he continued to exert his strength to get clear of the sentinels, until he fainted from the loss of blood; the boat was drifted down by the current into the Fair Water by the time he recovered. He made another effort and regained the shore, but weak and worn out by the loss of blood he fell down, and was taken up by a Russian out-post, and conveyed to an inn. A compress and roller was applied, and his strength supported by wine and a nourishing diet; the arm became much swelled and painful; fresh bleedings from the wound followed every two or three days, and then fresh bandages or compresses were added to the former, until the seventeenth. I was called in to visit him. I found him pale, with a livid countenance, and his eyes sunk in his head; his pulse in the right arm was one hundred, and upwards, and scarcely perceptible; the hand was much swelled, and soft to the touch, as if pus were formed. I recommended amputation; dreading from the length of time, and the state of the cellular membrane and muscles, that mortification was approaching. A consultation of English and Prussian surgeons was held at six o'clock the same evening. I entered the room a few minutes too late, when a Prussian surgeon was undoing the last turn of the roller; the blood sprung from the wound across the room; the surgeon stood amazed—without making any endeavour to stop it. I laid hold of the arm, and compressed the artery on its passing out of the axilla, and applied the tourniquet. On exposing the arm, the whole appeared marked with the roller, whose spiral pressure left evident marks of its inclosing a fluid diffused among the muscles, and the arteries still continuing to bleed internally, I amputated the arm above the joint, which the patient endured with great resolution. I gave him an opiate, and ordered him a glass of port negus three times in the course of the night.

DISSECTION. I made an incision in the course of the wound and found both arteries wounded, and the whole of the interstices of the muscles filled with coagulated blood;



and continuing the incision from the lower wound, down into the hand, four ounces of well-digested thick pus escaped ; I made another incision on the back of the arm and found the blood equally diffused, the muscles and cellular substance appearing one black mass, with every sign of approaching gangrene. The next morning I found him sitting up in his bed, quite cheerful ; pulse soft, full, and considerably reduced ; fearful lest adhesion might not take place by the first intention, and having no after inflammation to dread from the great loss of blood previous to the operation, I ordered him a dram of bark four times daily. The second day I found him walking the room without the smallest degree of fever : cautioned him to be careful, but did not confine him to bed. The fourth day I opened the stump, found that very little adhesion had taken place ; a great discharge of coagulated matter from the stump ; dressed the stump, and continued his bark as before. On the next dressing I found the matter better, and less in quantity than on the former dressing ; the wound discharging a thick pus, and skinning over very fast. Continued his bark and dressings until the twenty-eighth, when the stump almost skinned over ; but the French getting possession of the Fair Water, he fell into their hands to complete the cure, which only wanted a few superficial dressings.

There is always much difficulty in stating an aphorism in surgery ; in other words, the circumstances of the case are infinitely varied, and much is left to the discretion of the surgeon. A wound of the radial, or ulnar artery, is no case for amputation, nor would I amputate although one of the bones, and one of the arteries were pierced by the ball. But where both arteries are torn by a raking shot, in the manner above described, there can be no doubt of the propriety of amputation ; because to compress these arteries is to compress the whole arm, and to allow no circulation ; to take them up requires extensive incisions, and taken in addition to the wound, would leave the arm too much mangled to do good.

To say, that in any case where the radial and ulnar artery is cut by a ball the arm should be amputated, would be wrong. The arteries may both be taken up if the surgeon be on the spot; but when there is a raking musket-shot through the fore arm, and the arm is swelled, and the cellular membrane stuffed with extravasated blood, and the patient reduced, the case is totally altered.

## XI.

WHILE on this subject of wounded arteries, I am tempted to state some further facts regarding the force of the circulation by collateral anastomosing arteries.

A man having suffered a fracture of the lower head of the femur, had the misfortune, at a considerable distance of time, to have the popliteal artery torn on the rough projection of the bone. A tumour formed behind the knee; the progress of the tumour was more rapid than the common popliteal aneurism. The operation for aneurism was performed on the fore part of the thigh. By the tying of the femoral artery the swelling was only checked for a time; by and bye it began to increase; the knee joint became greatly distended; ulceration took place near the head of the fibula; and from this, pure blood escaped, so as to endanger the patient's life, and render amputation absolutely necessary.

In the amputation the femoral artery gave out its blood, and was secured as usual.—*On Dissection*, I found that the blood had continued to pass from the popliteal artery into the sac of the aneurism, and that the main artery was plentifully fed by the anastomosing vessels. The blood which escaped from the ulcer had come directly from the popliteal artery, in which there was a ragged hole.

This proves, that in the case of common popliteal aneurism, where there is a proper sac, the ligature on the femoral artery checks, but does not altogether impede the course of the blood into the sac; it interrupts the main channel through the trunk of the femoral artery, while the blood

continues to make its way into the part, even of the trunk of the artery which is below the ligature. This interruption to the blood, forcing it to take a circuitous route, gives opportunity for the entire coagulation of the blood in the sac, and then the cure takes place much in the manner of the spontaneous cure of aneurism. The preceding case, however, proves that where there is no regular sac and where the artery is wounded, this tying of the trunk of the artery high in the thigh, is not sufficient to stop the flow of blood from the wound of the artery.

I made another dissection which proved to me, that after the usual operation for the common case of popliteal aneurism the main artery continues pervious below the ligature ; and that it is the femoral artery and its branches, (and not the extremities of the profunda, articulating with the recurrent branches from the artery below the aneurism,) which carries on the circulation. Six weeks after the operation for aneurism, it was necessary, in consequence of partial mortification, and a caries of the fibula and bones of the foot, to amputate the limb. During the amputation I observed the blood flow in full jet from the femoral artery, on the face of the stump. Now the artery was here cut across not more than two inches below the place of the ligature used in the operation for aneurism. On injecting the anterior tibial artery with wax, the injection passed freely into the branches of the popliteal and femoral artery. So it is certain that here the blood was carried into the leg by the trunk of the femoral and popliteal artery, and that the main vessel remained pervious betwixt the ligature applied in the operation for aneurism, and the sac of the aneurism.

It follows then, that where there is a regular sac of an aneurism, the operation usually performed will be successful, by diminishing the force of the circulation, and allowing the blood in the sac to coagulate. But that where there is an open wound in the artery, and an extensive irregular cavity into which the blood flows, this ligature applied so high in the limb is insufficient, and the patient will most likely suffer amputation at last.

## XII.

I CANNOT close this chapter without saying something of the secondary bleeding from gun-shot wounds, in consequence of the slough coming away.

In the first place I positively deny that because a gun-shot wound bleeds, there must therefore be a great artery wounded; for I have seen wounds of the thigh, of the axilla, and arm, by musket balls, where much blood flowed, and yet there was no secondary hæmorrhage, and no great artery wounded, as the event of the cases shewed.

It would be great presumption in me to contradict the opinion of Mr. Hunter upon a subject of this nature, yet as I have felt alarms in consequence of what he says and others think they have confirmed, and have found my fears groundless, I think it necessary to state, that while I would still take the precaution recommended by so many in regard to the secondary hæmorrhage from gun-shot wounds, yet I do not think there is that occasion for trembling anxiety, which I at first conceived there was. On a late occasion, when I went among the wounded from *Corunna*, I had two purposes in view, first to satisfy myself on several points, of which I had just knowledge sufficient to make me doubt the received opinion; the other was that I might have striking instances of acknowledged facts, for the purpose of teaching; and amongst other accidents I thought we should have secondary hæmorrhage. I hope it will not be irrelevant that I state from my notes the opinion as it grew.

“It is singular that of all the hundred wounds of balls in these wards, with the sloughs hanging from the wounds, there is no instance of hæmorrhage.” In succeeding mornings I find still the same expression in my notes. “Now the slough is just coming out of several of these wounds; in cases too where I should imagine the artery must have been touched, yet in bringing the men ashore there has been no bleeding. I see a man wounded in the sartorius very near the femoral



artery. I see a man wounded where the ball has entered by the side of the insertion of the deltoid muscle, and passed out by the back of the arm, it must have gone betwixt the bone and the artery. I see another just brought in where the ham-string tendons are perforated, and it is miraculous that the popliteal artery could escape; yet in these instances no blood flowed on the coming away of the sloughs."

"I have noticed to day a great many wounded in the axilla, some where the ball has lodged, some where it has passed through. I see a wound where the ball has taken off the preputium, and passed into the thigh, and over the femoral artery, and there was bleeding as I imagine from the ramus inguinalis magnus, but there is no secondary hæmorrhage." "In the next bed a lad lies wounded on the inner condyle of the humerus; he was on the retreat, the firelock trailed, he received the ball on the inner condyle of the humerus, it was cut out upon the biceps, how did the artery escape? My inquiries were at last suspended\*. I found no instance of secondary hæmorrhagy. I began to think it was equally incorrect to say that every artery touched with a ball must slough and bleed, as it is to say that every bone touched by a ball must exfoliate."

In examining these fine fellows it was often exclaimed among us, how could the artery escape here? I can only suppose that the artery is the most limber and elastic, and (being a tube) the most compressible of any part in the limb, and that by its yielding to the push of the cellular membrane before the ball, it escapes the degree of attrition which would destroy life, when any thing opposing more resistance would inevitably suffer.

Let my reader, however, beware of the injunction in Mr. Hunter's work, p. 525, regarding the sloughing of arteries and secondary hæmorrhagy. I neither object to the fact

\* Let me here intreat those of my pupils who have been in Spain or Portugal, or who have had opportunities of watching their patients on the shot-holes becoming moist and the slough coming away, to satisfy me further on this head.

nor to the reasoning upon it. I only offer these observations as some relief to the anxiety from such a sentence as this:—"The patient lying easy even for ten days, is no security that in the end he shall not bleed to death." When large sloughs hang from the wound, when bags of matter form among the muscles, &c. in the tract of cellular membrane which accompanies the arteries, (a very frequent consequence of gun-shot, especially if the bone is injured) we must not consider all this extensive loss of substance as the effect of the contusion of the ball, nor the bursting out of blood as the consequence of the ball brushing by the artery. This case is in no respect different from the secondary hæmorrhagy after amputation, when there is a sloughing stump.

I acknowledge that these introductory observations to the following description of the manner of taking up the arteries, when cut in wounds, have been extended to a great comparative length; but I hope my reader will make the best use of the error, if it be one, and learn to consider it as a much more difficult thing to determine on the propriety of an operation than to do it.

#### OF THE SEAT OF THE VITAL PARTS IN THE THORAX.

A THRUST made with a small sword on the left side of the chest, immediately above the seventh rib, perpendicularly to the convexity of the chest, will pass through the diaphragm into the stomach, the heart escaping.

A thrust immediately above the left pap, and above the fifth rib, perpendicularly to the surface of the chest, transfixes the body of the left ventricle of the heart, perforating the anterior and extreme margin of the right.

A thrust made perpendicularly to the convexity of the chest, immediately under the anterior head of the fifth rib, will pass through the anterior edge of the right lung, and pierce the apex of the heart.

Perpendicularly to the convexity of the right side of the chest, and immediately below the anterior head of the third

rib, the thrust made will pierce the lungs and mediastinum, and pass through the right auricle.

A thrust perpendicularly down by the left side of the sternum, betwixt the fourth and fifth ribs, will pass through the upper part of the heart, near the root of the pulmonary artery.

A thrust perpendicularly to the convexity of the chest, immediately under the right pap, and of course the fifth rib, will pass through the root of the lungs among the great vessels.

A thrust with the small sword, horizontally from the greatest lateral convexity and upper edge of the seventh rib, will pass through the middle of the lower portion of the posterior lobe of the right lung, behind the heart, into the posterior mediastinum, where the aorta and œsophagus are about to pass through the diaphragm.

The arch of the aorta lies three-fourths of an inch below the level of the upper part of the sternum.

If the assassin strikes within the clavicle, obliquely down, with the stiletto, the point will, at the depth of three quarters of an inch below the upper edge of the sternum, pass into the arch of the aorta, and occasion a more sudden death than if struck into the heart\*; if the aorta should escape, some of the great branches will be wounded; even if the great branches should escape, and the trachea be wounded, the patient is in danger of instantaneous death, from the blood passing into the trachea suffocating him.

In regard to the course of balls through the chest, we are apt to be much deceived. The ball will strike the sternum or cartilages of the rib, and then glide betwixt the skin and the ribs, and either pass out altogether at the opposite point in the back, or lie there under the skin. A ball may penetrate the chest and lie there; it may pierce the lungs; it

\* I have a very interesting letter from Mr. Fuge, surgeon of the Dorset regiment, giving me an account of the case of a soldier, who was wounded at Corunna, and who lived fourteen days after a ball had pierced the right ventricle of the heart. The ball had entered on the left side of the sternum, betwixt the cartilages of the second and third ribs.

may pass through the chest and lie among the muscles of the back; or it may pass out altogether. When the ball enters the chest the shot-hole is evident to the finger or the probe, and the air is thrown out from the wound in expiration. When it has pierced the lungs frothy blood is spit up; but the question whether the ball is lodged in the chest, or has passed into the axilla, shoulder, or under the scapula, will not be so easily determined.

When the lungs are wounded, at first there is blood spit up; but that may cease from the vessels of the lungs closing, and from the diminished strength of the patient, the cough being dry and weak. When with the weakness and deadly aspect, coffee-coloured discharge is poured out from the wound, it is an exceeding bad sign; it proceeds from the resolution of the extravasated blood.

#### TO CUT FOR THE CAROTID ARTERY.

To cut down for the trunk of the carotid artery, I would turn the chin towards the same side, and then make an incision three inches in length along the anterior edge of the sterno mastoideus muscle. In doing this, the firm cellular membrane, and some of the anterior fibres of the platysma myoides must be cut. Having fairly laid bare the edge of the mastoideus, we ought to do no more with the edge of the knife; we ought then to hold aside the mastoideus, and, with the fingers and handle of the knife, dig down to the artery, and free it from the vein and par vagum, as we should free the vas deferens from the rest of the spermatic cord.

We find a small muscle, the omo-hyoideus passing obliquely over the artery, about an inch and a half from the head of the clavicle. The great internal jugular vein is close on the outside of the artery, the par vagum betwixt the vessels, the sympathetic nerve below, and close upon the vertebra. If a small nerve be observed running above the artery, it is the descendens noni.



If vessels bleed in making this incision, they are muscular branches of the thyroid artery.

#### TO CUT FOR THE EXTERNAL CAROTID ARTERY.

I HAVE not in this place to speak of the propriety of taking up this artery. I describe the exact situation of it, first to shew the possibility of putting a ligature round it; and in the second place to give such an accurate description of its place, as may enable the surgeon to avoid.

Cut through the skin from the lobe of the ear towards the point of the os hyoides: dissect through the platysma myoides; we then come to the digastric muscle, we dissect a little along its upper edge and there we find the stylo hyoideus; forcing this last muscle a little downward we find the continued trunk of the external carotid artery.

#### OF THE THYROID ARTERIES.

THE inferior thyroid lies in a situation not to be tied. It lies near the side of the vertebræ, where it is, on the outer side of the carotid artery, fully five fingers' breadth from the clavicle. It might be sought for directly under the omohyoideus, and betwixt the carotid and the anterior edge of the scaleni. But in the living body it cannot be taken up there. In cutting for it, I cut the sympathetic and the phrenic nerve. It would be better to endeavour to reach the ramus thyroidius, by turning over the side of the gland which lies before the carotid trunk. By thus stretching the gland, we find the artery as if descending from above, in two branches, to the lower part of the gland.

It may be proposed, previous to the attempt of extirpating the thyroid gland, to tie the four arteries which supply it. We cannot reach the inferior thyroid artery before it has passed under the carotid: the only possible way is, as I have just said, to lift up the inferior lobe of the tumour, separating the carotid from it; when we find the inferior thyroid

artery rising in two branches, to be distributed to the gland. It would appear that these branches were descending from the carotid, by the acute turn they take downwards from their highest point on the neck.

I hope none of my young friends will ever enter on the extirpation of the thyroid gland from any thing I have said here.

#### TO FIND THE LINGUAL ARTERY.

THE lingual artery makes its great curve (being tortuous) immediately above the great horn of the os hyoides; it then passes under the mylo-hyoideus. Were it ever necessary to cut upon it here, let the extreme point of the os hyoides be the mark; for it turns just above it to pass under the mylo-hyoideus. Cut through the platisma myoides, raise the lower edge of the sub-maxillary gland.

Take care of the nerve which you see lying near it: it is the ninth pair, and is betwixt the artery and the tendon of the digastrical or biverter maxillæ.

#### OF THE EXACT PLACE OF THE OCCIPITAL ARTERY.

THE occipital artery is found immediately under the mastoid process; from under the insertion of the mastoid muscle it runs backwards, on a level with the tip of the ear, under the insertion of the trapezius, and, of course, under the superior transverse ridge of the occipital bone. On the side of the neck, the internal jugular vein is immediately under it; it is under the origin of the digastricus.

#### TO FIND THE SUBCLAVIAN ARTERY.

THE patient is seated; and the assistant at his back, with his fingers in the cavity behind the clavicle, pushes forward and downward to compress the artery.

To cut for the subclavian artery, I begin the incision an inch from the inner head of the clavicle; I carry it in a direction slightly deviating from the line parallel with the clavicle, towards the acromion scapulæ. My second incision cuts the fibres of the pectoralis major, where they arise from the clavicle; I here come upon a thick bed of cellular membrane, which being lifted, I find the great subclavian vein, with the cephalic vein joining it; under this vein, and a little further backward (more under the clavicle) I feel the subclavian artery, and can put a ligature around it; the nerves are behind the artery.

N. B. If there should be a dangerous hæmorrhagy from the axilla, and the patient big and muscular, and the compression ineffectual; by making such an incision as is here described, (or perhaps somewhat less extensive, but sufficient to allow the finger to go through the clavicular portion of the pectoralis muscle) we shall be enabled, with much ease, to put the point of the finger on the artery, and press it against the rib, until the vessel in the axilla be secured.

#### THE LOWER PART OF THE AXILLARY ARTERY, OR BEGINNING OF THE HUMERAL ARTERY.

If we have to turn up the edge of the pectoralis major, to tie the axillary artery, we find the artery on the inside of the coraco brachialis; the external cutaneous nerve is on the outside of the artery, the radial nerve on the inside and the muscular spiral below it; the vein is betwixt the artery and the muscle; higher up in the axilla the artery is involved in the plexus.

I need not repeat, that in these descriptions of the exact seat of the arteries I intend that they should enable the surgeon to avoid them, as well as to cut upon them and take them up. By attending to the above circumstances I cut a ragged ball out from behind the artery and nerves without hurting either.

## THE HUMERAL ARTERY LOWER IN THE ARM.

THE humeral artery does not run a perfectly straight course down the arm. When the subject is laid on its back, the arm by the side, and the palm of the hand flat upon the table, if we push a point horizontally under the arm bone, one hands' breadth from its head, the artery escapes. When in the same horizontal direction, two hands' breadth from the head of the bone, the artery is transfixed. Lower down the arm, the artery again rises towards the fore part of the humerus.

To find the humeral artery before passing over the elbow joint, we make the patient bend the other arm against a force, to shew the expansion of the biceps. Having marked its place, we refer it to the wounded arm, and make an incision along the inner edge of the biceps, or rather, we might say, just where it begins to throw off its tendinous expansion, that is, two fingers' breadth from the inner condyle of the os humeri, and carry the knife upwards. We do not immediately find the artery, but the radial nerve covering the artery; laying the nerve aside, we find the artery lying betwixt its two *venæ comites*.

## THE RADIAL ARTERY.

To find the radial artery in its course one third down the arm,—cut on the inner edge of the *supinator longus*, first through the thin fascia—then lift the edge of the muscle, and under a second fascia you find the radial artery, passing over the tendon of the *pronator teres*.

1. To take up the radial artery on the wrist, we cut a quarter of an inch from the radial edge of the *Flexor Carpi Radialis*. A fascia covers the artery here. A small nerve (from the *external cutaneous*) runs above the fascia. N. B. The insertion of the *Supinator Radii Longus* is on the outside, but flat, giving no mark outwardly. The *Extensor Primi Internodii Policis* comes obliquely over the head of the *Radius*, and the insertion of the *Supinator*.



2. To cut for the Radial Artery, when it has passed from the fore part of the wrist, we carry the knife on the outside of the insertion of the *Extensor Primi Internodii Policis*, and the inside of the *Extensor Tertii Internodii Policis*. Betwixt these tendons the artery lies very deep, and over it the extreme branch of the *Muscular Spiral Nerve*. We find the artery going close in the notch, betwixt the os scaphoides and the trapezium.

#### THE ULNAR ARTERY.

*Ulnar Artery.* 1. In the middle of the fore arm the artery lies under the fascia and under the margin of the *Flexor Ulnaris* and *Flexor Digitorum Sublimis*, rather more under the margin of the last. To tie the artery, we should have to cut down betwixt these muscles. The *Ulnar Nerve* lies on the ulnar edge of the artery.

2. To cut for the ulnar artery near the wrist. We carry the knife upon the radial side of the *Flexor Carpi Ulnaris*; we raise the fascia, which binds down the tendon; but still we have another layer of the fascia, under which the artery and its *Venæ Comites* lie. The *nerve* is lying still more under the tendon of the ulnaris than the artery, but close upon the artery.

#### TO TAKE UP THE FEMORAL ARTERY LOW IN THE THIGH.

SEE the operation for Popliteal Aneurism, Volume I. page 54.

#### TO FIND THE GLUTEAL ARTERY.

To strike upon the gluteal artery, we cut in the direction of the fibres of the gluteus maximus, beginning about two fingers' breadth beneath the posterior spine of the ilium; we cut through the gluteus maximus and medius just

upon the lower edge of the ilium; we find the trunk of this artery rising to mount upon the back of the ilium; we must observe too, that considerable branches are carried outwards through the muscle, into which we must cut to arrive at the seat of the trunk.

In case of a wound of this artery and the formation of a false aneurism, the surgeon has to push his finger decidedly down upon the trunk of the artery, as it turns over the notch of the ilium, and compressing it there, he may gain time to clear away the blood.

#### THE ISCHIATIC ARTERY.

To hit upon the ischiatic artery as it comes out from the pelvis, begin the incision by the side of the sacrum, three fingers' breadth from the posterior spinous process of the ilium; and carry it down in the length of the fibres of the gluteous maximus, to the outside of the tuberosity of the ischium. Even in a thin man, the artery lies two inches deep. Now, pushing in the finger as if under the sacrum, we there feel the acute edge of the sacro-sciatic ligament; on the lower margin of the sacro-sciatic hole, (which is distinctly felt with the finger amongst the looser parts,) the artery is felt crossing the ligament obliquely; near it, upon its outer side, are some lesser nerves; the great sciatic nerve is removed an inch from it.

#### TO CUT FOR THE ANTERIOR TIBIAL ARTERY, HIGH IN THE FORE PART OF THE LEG.

THE anterior tibial artery comes through betwixt the bones, one inch below the projection of the knob of the fibula. To find it we cut through the strong fascia which is extended betwixt the heads of the tibia and fibula; we then cut by the edge of the *peroneus longus*, and follow the partition fascia which is betwixt this muscle and the head of the *Extensor Digitorum Communis*. This partition carries us deep: we find the artery lying on the interosseous ligament.

Wherever we have to pierce a fascia for such a purpose as this, it must be cut very freely.

#### TO CUT FOR THE ANTERIOR TIBIAL ARTERY, LOWER IN THE LEG.

To cut upon the anterior tibial artery about the middle of the leg, I take the spine of the tibia for my mark. I should cut through the strong fascia at such a distance from the ridge of the tibia, as to be able to carry my knife between the *tibialis anticus* and *Extensor Policis Longus*.

To cut upon the artery as it passes over the lower end of the tibia to go forward upon the foot, we make our incision between the projecting tendons of the *Extensor Longus Policis* and *Communis Digitorum*.

#### TO CUT FOR THE FIBULAR ARTERY.

It seems a shocking alternative to be obliged to saw out the fibula, in order to tie this artery. I recommend that this should never be performed.

To find this artery two hands' breadth from the heel, cut betwixt the *Gastrocnemius* and the *Peroneus Longus*, i. e. on the outside of the *Gastrocnemius*, where it is becoming tendinous; turn up the edge of the tendon; you then find the *Flexor Policis Magnus* covered with its sheath. If you seek for the Fibular Artery, by going deep into the leg without piercing this fascia or sheath, you find the *Tibial Nerve*, and may come on the *Tibial Artery*. To find the Fibular, then, we cut down by the side of the bone (fibula) and raise the fibrous origins of the *Flexor Policis*. We then find the artery by the acute edge of the bone, lying on the interosseous ligament, accompanied only by its *Venæ Comites*.

#### TO CUT FOR THE POSTERIOR TIBIAL ARTERY.

*The Posterior Tibial Artery.* For complicated wounds in the sole of the foot, this artery may require to be taken up

behind the ancle joint, and before it pierces under the abductor policis pedis. We shall be directed to the exact place, by observing the lowest projecting part of the tibia. The tendons, which run close upon the tuberosity of the bone, are the Tibialis Posticus, and Flexor Communis ; the first lies so closely braced to the bone in its particular sheath, that it will not be observed ; the artery runs a little nearer the heel than the tendon of the Flexor Communis ; a fascia braces down the artery, the nerve is under the artery.



## APPENDIX.

---

IN the chapter of fractured bones I have omitted to give the varieties of fracture by gun-shot. As it is a subject neglected also by other authors, I take this opportunity, (though somewhat irregularly,) of remedying the omission.

### OF THE VARIETY IN THE FRACTURE OF BONES BY GUN-SHOT.

I. THE surface of a bone may be struck by a ball so that the ball is flattened on it, and yet no exfoliation of the bone takes place. I cut out a ball from the arm seven months after it had struck the humerus, and although it was flattened on the bone, the bone was not injured. I have seen the head of the humerus struck by a ball, which ball I found in the muscles of the back, as if divided, and yet no exfoliation took place. When the surface of a skull is hit by a ball, there is undoubtedly great danger, but still nothing is to be done in the way of operation; the skull will often escape unhurt, having suffered neither contusion, nor such injury of its surface as to make it exfoliate. My pupils have related many cases to me where they have seen the skull struck by balls without a bad symptom; but lately, I have myself seen three cases of this kind, in one of which the ball was flattened, and passed two inches under the scalp, and yet there was no injury to the skull. However, where the danger is so imminent, and where if symptoms of an affection of the brain be allowed to commence, it is so seldom in our power to stop the progress of suppu-

ration, that it is of the utmost consequence to watch and to keep the patient low.

II. There is a considerable difference of character between the gun-shot fracture of the cranium and the fracture from a bludgeon, or from the head striking the ground; the fissures do not run so extensively from the shattered centre; the injury is more local; the fractured pieces are smaller, and more numerous; often comminuted. In taking away these pieces the trephine will seldom be necessary; yet let me here once more guard my reader against forcibly pulling away the pieces of the broken skull, for if he tear the dura mater, a new and more dangerous case is established.

III. When a ball strikes the cylindrical and middle part of a bone, it will break it into many pieces; but if it strikes the head of a bone, it will enter into it. If, in putting the finger into the shot-hole, where the ball has struck the centre of the bone, many bruised pieces are found,—if the ball has not merely hit the bone and struck off splinters, but has passed through its substance, then, I believe, the limb must be condemned, for no good comes of the attempt to preserve it. The suppuration not only takes place amongst the soft parts, but in the centre and medulla of the bone; a bad discharge comes from within the bone; the shaft of the bone dies, and a kind of imperfect and irregular necrosis is formed. The old bone does not unite; new bone is formed round both pieces; the sequestra remain loose, and yet so wedged, that it cannot be taken out, and it is therefore a tedious source of irritation, and after months of suffering, amputation must be had recourse to.

IV. There is a marked distinction, however, betwixt such a case and that where the ball does not *perforate* the bone with unsubdued violence, but merely breaks the bone; and there is of course a great difference betwixt the ball perforating the arm bone, the thigh bone, or tibia, and when the bones of the fore arm, or the fibula, are broken. I have seen the arm amputated for the shattered state of the ulna; but I believe this was wrong; for before and since I have seen worse cases do

well, with but common care ; nor is the combination of a shattered radius and a torn radial artery a case for amputation.

V. In all cases of the ball entering the heads of bones it does not follow that they pierce or lodge. I have specimens of all kinds of fractures by gun-shot, and amongst them the head of the humerus shattered to pieces. In Haslar hospital there lay three men with the heads of the humerus shattered by balls ; there lay many too struck about the shoulder joint. If a man be struck on the top of the shoulder, and upon laying the hand over the joint, and moving the arm, the bones are felt jarring, and the bone be not merely fractured, but we discover by the finger in the shot-hole that they are crushed, it is a case for amputation at the shoulder joint.

VI. When the ball enters into the lower head of the femur, and lodges, we may be long in suspense. By and bye the whole limb inflaming, and becoming greatly swelled, an abscess forms, perhaps, in the calf of the leg ; we are then tempted to think that the ball has fallen down to that place, and that the abscess being opened the ball will be found. But I have twice found this to be a great mistake ; the ball has stuck in the bone ; it is a source of great irritation ; that irritation is not immediately shown by its effects on the bone, but on the surrounding soft part of the limb, and, as I have said, on the part of the limb below the seat of the ball. This swelling and great abscess in the leg, on dissection, shows not the cavity of the abscess formed in the cellular membrane, but the inflammation goes so high that the very texture of the muscle is destroyed. Besides this consequence of the injury to the bone there is another effect to be taken into consideration, the swelling of the knee joint ; although the capsule of the joint be not opened, yet the ball being socketted in the head of the femur, or tibia, the effusion of the joint will be converted into purulent matter ; on dissection, after amputation from such a cause, I have seen six ounces of pus from the knee joint. The ball immersed in the lower head of the femur followed by these consequences of violent inflammation, makes a case for amputation.



I know that a man has been shot in a duel, or on the highway, and has received a pistol-ball in the bones near the knee-joint ; I have been consulted on a pistol-ball lodging about the knee ; and a case has been communicated to me of a pistol-shot through the head of the tibia ; and in all these cases the limb was saved. But this only shews the propriety of the distinction I have made, that it is not merely the lodging of the ball, or the transpiercing of the bones by the ball, but this followed by the circumstances described, which makes the necessity for amputation. The case will be essentially changed if the wound is by a pistol-bullet, not by a musket-ball. The features of the case will be still more essentially changed if instead of the soldier being thrown into a waggon, or transport, without medical attendance, he be laid in quiet and rest, and bled, and kept low, and the inflammation subdued by cold applications. But I return to my position by saying, that I have seen the same case in all important circumstances, and the same necessity of amputation, from the ball lodging in the head of the tibia, that I have described as proceeding from a ball piercing the femur.

VII. It must be remembered, that when inflammation has arisen, and the whole constitution has sympathized with the injury of the part, it is more difficult to controul it than it is to ward off inflammation, and save the limb, when we receive the patient before it has commenced. If in such a case as I have described above, we are enabled by bleeding and cold to keep down the rising inflammation, yet the constitution is alive to this impression of injury, and the patient may suffer from severe and threatening spasm ; but after the full and repeated evacuation an aromatic and an opiate have the most soothing and agreeable effect.

VIII. In the examples which I have of balls that have entered the heads of bones, and the body of the vertebræ, there are none of them changed in figure. I know this does not absolutely follow, yet when we have to extract a ball from the centre of a bone, we may expect it to be still a ball, whereas if



it has struck a bone and glided amongst the soft parts, it scarcely ever keeps its regular figure.

If, however, a ball strikes and splinters a bone, and then lodges again, the probability is, that the lead will be quite irregular, or ragged. For example ; a ball has entered on the wrist, fractured the radius, passed out of the fore arm, and entered again into the arm, or the axilla, or side ; we need not search for a ball, but a piece of lead.

I have found the lead as irregular as if it had been melted and cast into water. In searching for the ball it may be thought very easy to distinguish betwixt the surface of the lead and the bone, but it is not always so ; I have seen three experienced and good military surgeons tug in succession on the bone itself, mistaking the edge of the perforated bone for the ball.

IX. When a ball has entered and is lost, and we know not the course it has taken ; if suppuration takes place over the surface of a bone, which bone is in the probable track of the ball, there is a strong probability that it lodges there. In this case it is not the presence of the ball, so much as the injury committed on the bone which is the cause of the suppuration. A man being shot in the fore part of the chest, a suppuration above or under the scapula implies that the scapula is struck. I have seen a wound in the back where suppuration over the sternum declared that the ball had stuck in it, after passing through the chest.

FINIS.





Med. Hist.

WZ

270

B434sys

1812

v. 2



